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Compressed Air Magazine

JULY 1946

TUGBOAT SET TO PULL DOWN SPAN

One step in the razing of a bridge that was used in building Grand Coulee Dam

(Bureau of Reclamation Photo)

VOLUME 51 • NUMBER 7 NEW YORK • LONDON

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ON THE COVER

TUGBOATS are familiar sights on the coastal waterfronts, where they perform so many tasks that they are sometimes called "maritime workhorses." Our cover picture shows one of these doughty little ships playing an unusual part in the demolition of a construction bridge across the Columbia River and downstream from Grand Coulee Dam. Here the tug *Blue Ox*, a name that is reminiscent of the fabulous tales of Paul Bunyan, is shown as it is about to pull down a wooden side member of the bridge superstructure preparatory to beaching it for dismantling. The picture is also reproduced on page 182 as one of a trio showing the sequence of operations.

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IN THIS ISSUE

UNBELIEVABLE Los Angeles continues to grow like the proverbial beanstalk, and there seems to be no stopping it. In our leading article we have set down some of the factors that have brought it to its present proportions and that bid fair to send it merrily along its bulging way.

•

EXCELLENT photography adds interest and clarity to the brief description of a bridge-razing job that came as an aftermath of the construction of the world's largest dam. See page 181.

•

THERE is something alluring about ghost camps, especially when they threaten to throw off their shrouds. Cobalt, the Canadian mining community that has been in a coma for many years, is showing signs of reviving. Rising demand and better prices for silver and cobalt are responsible. See page 186.

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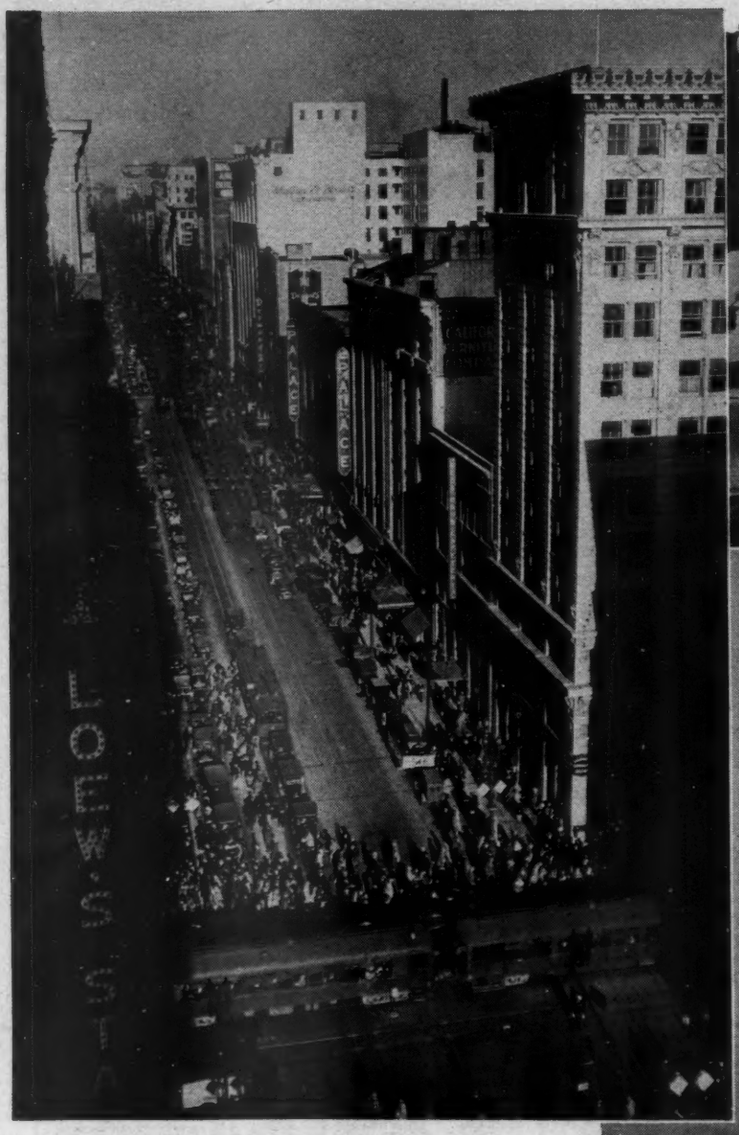
Los Angeles Forges Ahead

C. H. Vivian



THIS IS LOS ANGELES

No small group of pictures could adequately portray kaleidoscopic Los Angeles. Sprawled irregularly over 450 square miles of terrain that rises from sea level to an altitude of 1692 feet, and composed of an aggregation of former separate communities, it is a blending of the urban and semirural. To foster the knitting together of these far-flung units into one corporate body, the City Fathers long ago encouraged the development of outlying sections by limiting the height of buildings to 150 feet. There is, nevertheless, a considerable concentration of business activity and humanity in the principal shopping district, as is attested to by the view above showing a stretch of Broadway. Contrast this with the producing oil well in the middle of a street (right). The nucleus of the Civic Center, under development since 1925, is seen in the lower picture, opposite page. Early residences were mostly of the bungalow type borrowed from India, but the more recent trend is towards the "California House" of Spanish design (top-center). Los Angelenos say that their Wilshire Boulevard (top-right) is destined to become one of the world's outstanding thoroughfares.

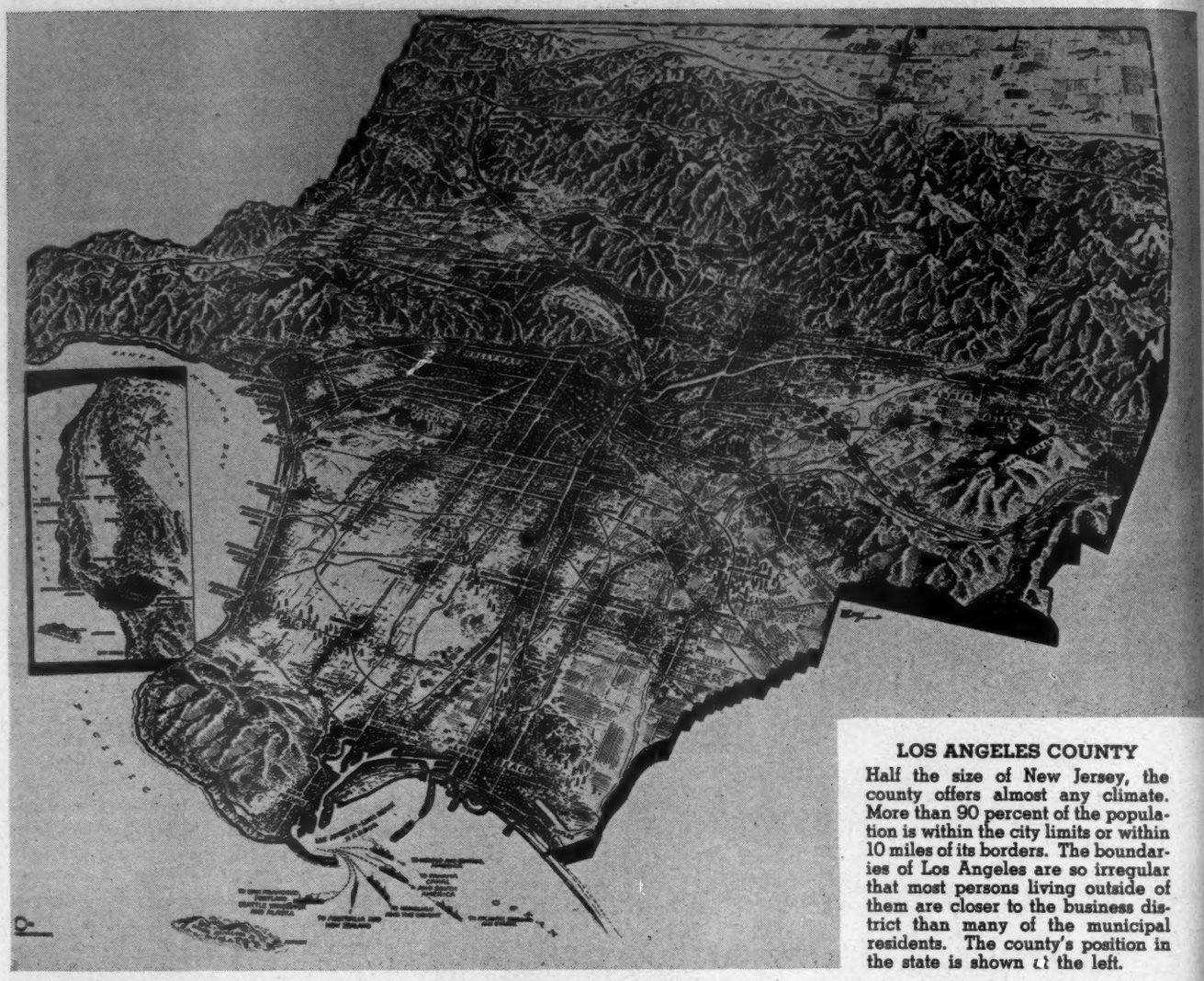
AT THE end of March of this year, the Bureau of the Census accorded to Los Angeles a population greater than Detroit's 1940 count, and it may well be that it is now the fourth city in the nation, exceeded only by New York, Chicago, and Philadelphia. It was freely predicted elsewhere than in the Far West that Los Angeles and Southern California in general would be deflated as soon as the war ended, but this has not come to pass. Instead of contracting, the fabulous land of sunshine, citrus, and cinema goes right on expanding and continues to confound the experts. This persistent upsurge of the Pacific Coast Metropolis is one of the amazing phenomena of twentieth-century Americana.

Considerable numbers of war workers did go back to their former abodes after V-J Day, but other thousands came in to take their places. The population is being further increased by the acquisition of service men who formerly lived in every part of the nation. These are young people who became enamored of the section while undergoing training there and couldn't get it out of their minds.

Los Angeles is now in the latter stages of a transition that began a quarter-century ago. It got its first lusty growth because people found it a pleasant and healthful place. It swelled to surprising proportions by benefit of little more than climate, advertising, and horticulture, but it was realized that sustained increase would be contingent upon the development of industries. Consequently, at the close of World War I, when conditions somewhat paralleled today's, a drive was made to persuade eastern manufacturers to locate branch factories or assembly plants there. The campaign was singularly successful, despite a formidable array of reasons why it should not have been so.

Foreseeing that the conclusion of World War II would create great unemployment unless counteracting steps were taken, the city redoubled its efforts in recent years so as to woo eastern industry, and again the response has been favorable. At least 30 eastern and midwestern manufacturers bought sites in Los Angeles County during the war and will start building as soon as materials are obtainable. Other companies stand ready to come in if factory space can be provided for them.

The fundamental reason for industry's westward move is that people make markets, and not only Southern California but also the remainder of the state and its sister Pacific Coast states have been getting more and more people all the while. Between April 1, 1940, and July 1, 1943, California, Oregon, and Washington gained 2,001,691, according to the Census Bureau. Their total population stood at 11,734,953 on the latter date. More recent official figures for the states are not available, but it is certain that further increases were registered during the past three years. Estimates of California's wartime gain range all the way from one to two million, with the



LOS ANGELES COUNTY

Half the size of New Jersey, the county offers almost any climate. More than 90 percent of the population is within the city limits or within 10 miles of its borders. The boundaries of Los Angeles are so irregular that most persons living outside of them are closer to the business district than many of the municipal residents. The county's position in the state is shown at the left.

former figure probably more nearly correct. So far as Los Angeles itself is concerned, we have comparatively up-to-date statistics, as mentioned at the outset. The Census Bureau's count as of last March 31 was 1,805,687, representing a growth since 1940 of 301,410, or almost the equivalent of the entire population of Rochester, N. Y., or Denver, Colo. More significant is the increase of 55,087 persons that has taken place since June 30, 1945.

The bugaboo of surplus population at the war's end has turned out to be no more frightening than a scarecrow. Most of the men and women thrown out of jobs in the Los Angeles area by the termination of war contracts acquired valuable skills while working in the airplane factories, shipyards, and other establishments that fed upon the fighting. They now constitute an efficient labor pool that can be drawn upon by manufacturers that locate new plants in the district. Consequently, they are an asset instead of a liability.

Heretofore, the Pacific Coast has been at a disadvantage in its efforts to attract heavy industries because it has had no basic steel-making facilities. In the past few years some relatively small steel mills have been located there, but no blast furnaces. The nearest source of pig-iron production was Columbia Steel Company's single blast furnace in Utah. Aside from its output, California's pig-iron supply has been shipped in by water from the eastern seaboard, or from India. During the war, however, Henry Kaiser's integrated steel mill was erected at Fontana, almost at Los Angeles' back door, and the larger government-owned enterprise of the Geneva Steel Company was created near Provo, Utah, where iron ore, coking coal, and limestone are fairly near at hand. The latter plant has been purchased from Uncle Sam by the United States Steel Corporation for $47,500,000.

The wartime facilities of both the Fontana and the Geneva mills were set up primarily to produce plates for shipbuilding and will require some transformation to fit them for peacetime purposes. It is probable that a considerable part of their capacities will be given over to the making of tinplate for California's enormous canning industry. There are some economic uncertainties to be resolved in connection with the operation of both plants, but sanguine Californians take it for granted that they will be ironed out satisfactorily. Should this transpire, it will pave the way for the creation of a vast industrial empire on the shores of the Pacific and bring a long-cherished ambition to realization.

Considering the great strides that Los Angeles has made since it got up momentum, it is interesting to note that it existed in name only at the time the nation won its independence. The area was then under the Spanish sphere of influence, but the Spanish were perfectly satisfied in Mexico and did not choose to move northward until they fancied that other nations had designs on the territory. A Portuguese sailor, Juan Rodriguez Cabrillo, is credited with having been the first white man to set foot in Southern California. He sailed up the coast from Mexico and entered the harbor at San Pedro on September 28, 1542. Sixty years passed before another explorer came along, and 239 years before Los Angeles was founded.

During the American Revolutionary

period, Russian and English expeditions were active in Alaska and down the coast to what is now our Northwest. Those activities impelled the Spaniards, under Capt. Gaspar de Portola, to move up from Mexico in 1769 and establish a base at San Diego. The avowed purpose of the Spanish Government was to christianize the natives, set up presidios or garrisons, establish pueblos, and work the land. In July of that year, a party that included some brown-robed Franciscan monks marched northward from San Diego and reached an Indian village on the present site of Los Angeles on August 1. On the following day it was christened *El Pueblo de Nuestra Senora la Reina de Los Angeles*, "The Town of Our Lady, Queen of the Angels."

The pueblo was not established, however, until September 4, 1781, when twelve families, numbering 46 persons, laid out a plaza around which their homes were to be built. They came from the Mission of San Gabriel, which had been set up ten years previously a short distance away. Los Angeles was founded by order of King Carlos III of Spain "with both religious and military pomp, with the swinging of censors and the burning of incense, and the stately music of the *Te Deum*." Felipe de Neve, third governor of the Province of California, closed the ceremonies with an address.

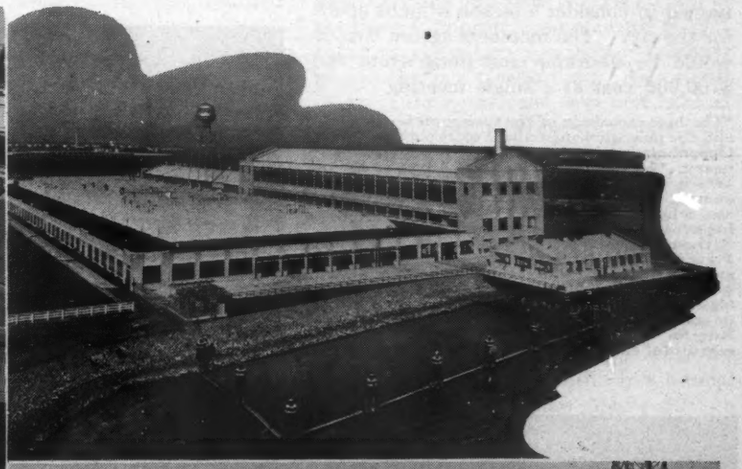
The first settlers were allotted tracts of land and dug a ditch to convey irrigating water to them from the stream (Los Angeles River) that issued from the San Gabriel Mountains to the east. The original pueblo contained 28 square miles. Each family was to receive an allowance of $116.50 for two years and $60 for the next three. At the end of three years it was to have its land cleared and an adobe house on it, and at the termination of the 5-year period to have a crop of wheat and corn, chickens, etc.

By 1790 the population had increased to 141, and in 1818 the first church was erected. The citizens gave 500 head of cattle toward its cost, while the padres at San Gabriel Mission contributed seven barrels of brandy worth $575. In 1835, after 54 years of existence, the town numbered 2000 persons, but water for both irrigation and domestic purposes was still being transported in open ditches. Farming and related pursuits supported the inhabitants, but the first manufacturing industry had been established. That was the making of wine and brandy.

Los Angeles was incorporated as a city in 1850, but it did not begin its meteoric rise until it was more than 100 years old. The 1880 census gave it a population of 11,183. During the next ten years it increased nearly fivefold—to 50,395, and in the following decade it doubled again, reaching 102,479. Figures at 10-year intervals since 1900 are: 319,198 (1910); 576,673 (1920); 1,238,048 (1930); 1,504,277 (1940).

The first population stimulus was the discovery of gold in California shortly after the American flag was raised in Los Angeles in 1846. The next and probably the greatest factor that influenced its growth was the discovery by America at large that Southern California has an equable climate. It was favored from the beginning by health seekers, and many of those that have contributed to its development went there on the advice of physicians. The veritable deluge of humanity that poured into Los Angeles in the early 1920's was precipitated by a railroad-rate war that reduced roundtrip fares from midwestern points to the ridiculously low figure of $15. Many of the bargain-day tourists never used their return tickets. Others went back to their homes only long enough to settle their affairs and then left again for the land of sunshine.

"Fortunately for the new city," wrote Ramsey Oppenheim in 1941, "a large



THE INDUSTRIAL SCENE

Petroleum production and refining is the leading industry of Los Angeles County. Closely spaced derricks at Venice, within the city limits, are seen at the right. Los Angeles is second to Detroit in the assembly of motor vehicles. The view at the upper-right shows the Ford plant, which is located on the harbor front to facilitate receiving parts and shipping finished cars. A section of the city's wholesale produce terminal and market is illustrated above. Virtually all the fruits and vegetables are raised within the confines of Los Angeles County.

number of those who came were men of ability, men who had been successful as farmers, merchants, and bankers. Many brought their accumulated fortunes with them. They bought homes. They settled on the land and planted orchards and tilled the fields. Those who came to retire, to live their last years in an easy climate, added not only population but wealth as well. Of the latter, many soon became restless. They caught the spirit of the place. They invested money in Los Angeles enterprises and often were tempted to start anew the sort of business life to which they were accustomed. And because these were competent people, they have been a considerable, almost a vital, factor in the industrial and economic growth of the area."*

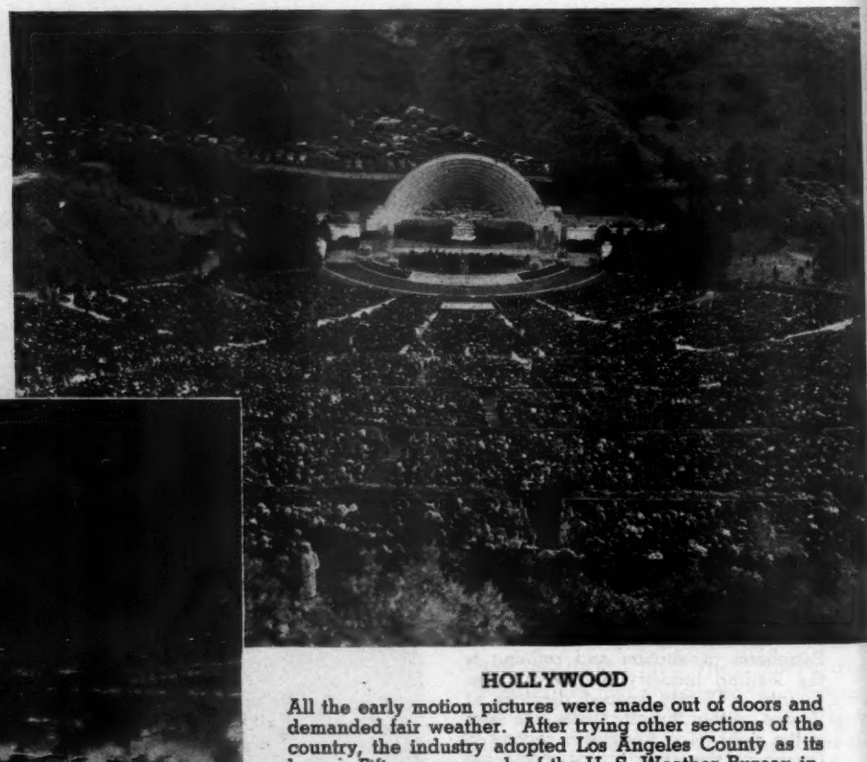
The name Los Angeles is almost a synonym for advertising. The city has always been strong for publicity, and with good reason, considering the results obtained. The fountain head of its promotional work is the Chamber of Commerce, which is generally considered a model of its kind. It spends half a million dollars annually, has a paid staff of 155 persons, and occupies its own spacious building. It has 6000 members, and 2000 of them serve on 148 committees. Their method of functioning exemplifies the Los Angeles way of getting things done quickly. On one occasion a committee was named to consider a season of light opera for the city. The members agreed that it would be desirable and underwrote the $100,000 cost at a single meeting.

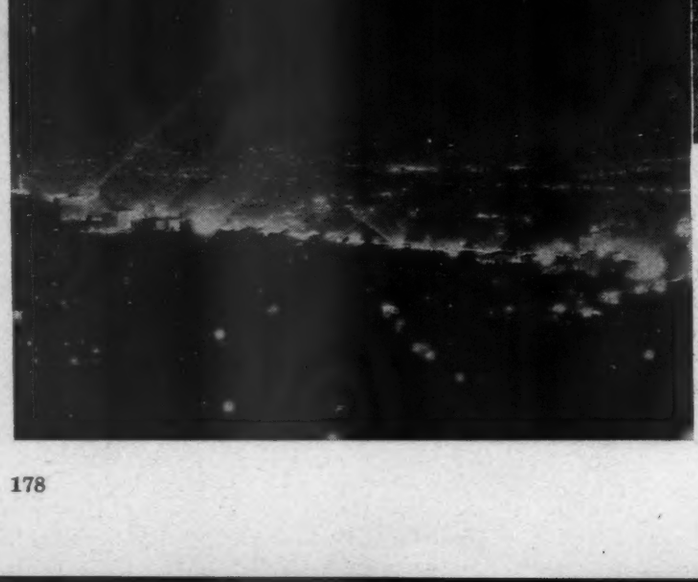
Quoting Mr. Oppenheim again: "It is not so much that the big business interests are identified with the Chamber of Commerce merely as contributors to its big budget. They do this in any wide-awake American City. But there is this difference: here the big men go much further, they contribute generously of their ideas and of their time. They take this work as seriously as they do their private enterprises. They know what they want and they go after it. There are 42 men on the chamber's board of directors; at the weekly meetings of the board they count on 35-40 to attend. When a committee meets, attendance comes close to the 100-percent mark. But the important thing is that the big men, the top men, attend these meetings. They do not delegate the duty to the traditional vice-presidents."

The chamber stemmed from the Board of Trade, which was organized in 1873. The former was organized in 1888 on the motion of Gen. Harrison Gray Otis, owner of the *Los Angeles Times*. It started out with the idea of convincing the people of the area that they could produce their own vegetables, butter, cheese, and eggs, most of which were then being shipped in. Today the situation is reversed: Los Angeles County leads the counties of the nation in vegetables raised, and sends them to all parts of the country. At about the same time, the vast citrus-fruit industry of the region was coming into prominence. Oranges had been grown there for a long time, but they were not of the navel type that has become known as the California orange. The latter was introduced in 1873 when L. C. Tibbitts of Riverside received two small trees from Bahia, Brazil. They were the source of the present extensive groves. The first carload of oranges was shipped East in 1877 by way of San Francisco, which was then the only rail outlet. The first direct railroad from Los Angeles to the East was not put in service until 1885. Two months after the chamber was formed, it printed 10,000 pamphlets describing the area and its resources. During the next few years the press run of that publication grew to a million copies.

For many years the chamber was essentially a one-man affair, the man being Frank Wiggins. A saddlery merchant, he left Richmond, Ind., for Southern California in 1886 as a last resort, being unable to walk unaided. Retaining bodily vigor, he became identified with the chamber in 1889, was made secretary in 1897, and carried on for 25 years. He conducted the first industrial survey so that jobseekers might be given intelligent employment leads. He insisted that there

*The best exposition of the success of Los Angeles and the most glowing tribute to its potency is Mr. Oppenheim's critical study published in the February, 1941, issue of "Western Advertising" of which he is editor and publisher. Strangely enough, he lives in San Francisco. A decade or two ago, when Frisco and Los Angeles were glowering at each other, this could not have happened. Although outstripped by its southern rival, San Francisco has, nevertheless, also made startling progress. Amicable relations were established with the mutual realization that California is big enough to have two large cities. Considering its source, it is easy to understand why the Los Angeles Chamber of Commerce likes to hand out reprints of the Oppenheim survey





HOLLYWOOD

All the early motion pictures were made out of doors and demanded fair weather. After trying other sections of the country, the industry adopted Los Angeles County as its home. Fifty-year records of the U. S. Weather Bureau indicate an average of 179 clear days per year and a 72-percent possibility of sunshine. There are only 37 days with more than 0.01 inch of rainfall. Situated 8 miles from Los Angeles' business district, Hollywood is a city within a city, with its own identity. The night picture at the left shows searchlights piercing the sky to herald the premiere of a new movie. An Easter-morning assemblage at the sunrise service in Hollywood Bowl is seen above.

THE HARBOR

San Pedro, the principal port of the city, is 24 miles from the original pueblo of Los Angeles. It was annexed in 1909, and millions of dollars have been expended in improving the harbor facilities. It now ranks next to New York in volume of export tonnage handled. The leading freight is petroleum.

should be a display of Southern California products, and went out with a horse and buggy to gather them in. During his tenure he was in charge of every exhibit the chamber had at expositions, and was the father of a traveling exhibit—"California on Wheels"—that toured the country.

Canning and a few other industries, mostly small, were developed prior to World War I. Although the city ranked tenth in the nation in population in 1914, it stood twenty-sixth in the value of its manufactured goods. During the war years, steel ships were built on land that had been reclaimed from the sea. The first large national manufacturer to locate a plant in Los Angeles was the Goodyear Tire & Rubber Company, but others soon followed. When motion-picture production was concentrated in Hollywood, it not only provided an industry in itself but also, through the influence of films on men's and women's styles, boosted the clothing trade.

The war period, however, brought a depression to Los Angeles. During 1914-19 local business was 25 to 38 percent below normal, whereas in the country as a whole it was up as much as 17 percent. But the city's population continued to increase, the total accretion in the six years being 68,000. In 1919 the Chamber of Commerce launched its campaign for new industries in earnest. Business activity picked up markedly, bringing prosperity that lasted until 1928. The average annual gain during that interval was 30 percent, while it was less than 10 percent for the nation as a whole, where a drop to 13 percent below normal was recorded in 1924.

Space limitations prevent giving details of the industrial growth and the steps that were taken to accomplish it, but it can be summarized by listing the nine leading enterprises with their national standings as of 1939. Each of them had an annual output of $25,000,000 or more, and collectively they accounted for 60 percent of the city's industrial employment. The year 1939 is purposely chosen because it does not reflect any wartime inflation. The war somewhat disrupted some of these industries, and their rehabilitation is one of the leading orders of business today. That year, Los Angeles led the cities of the nation in the production of motion pictures and oilfield equipment. It stood second in the manufacture of airplanes and of tires and tubes, in the assembly of automobiles, and in the refining of petroleum. It was third in food output and fourth in the making of clothing and furniture.

Although not included in the foregoing list, the tourist business is classified as an industry in Los Angeles. There are sound reasons for this in view of the fact that the growth of the city and its surrounding area has come about principally because, over a long period of years, one out of every sixteen persons who visited the section has become a resident. The story of *The Man Who Came to Dinner* has been enacted there many thousands of times. Those who don't return are important too. In 1940, the last full prewar year, the 1,601,574 visitors spent $183,384,423.

The tourist business began to assume wholesome proportions in the 1880's. For a long time almost all vacationists came in the winter months, ostensibly to obtain relief from the cold and snow of the East and Midwest. Few spent the summer months there until the All Year Club of Southern California was organized in 1921 to inform the nation that the mid-calendar season also is a pleasant one. As a result of its efforts, tourists are now almost equally divided between winter and summer. During its first year, the club expended $46,000 in advertising; in 1940 the outlay was $209,000.

Here are some statistics on the climate, which is the chief drawing card for visitors. The average winter daytime temperature is 68°F., and the mean daily temperature in January, the coldest month, is but 16½ degrees lower than the average for August, the warmest month. In a normal year, the mercury goes above 90° on thirteen days and below 40° on the same number. There are only ten days that are wholly devoid of sunshine and only 37 when rain falls, compared with 161 in New York City. The mean annual rainfall is 15.23 inches.

Although Nature was lavish with some gifts, she was niggardly with others, and Southern Californians have consequently had to do more than just advertise and wait for people with money to come and establish businesses. The greatest shortcomings were lack of water and power, two indispensables for the development of industry. Yet, both are there in abundance today, having been provided in the face of obstacles that caused the magazine *Think* to write: "Here, by the sweat of his brow, has man turned a desert into an Elysian field, and an isolated frontier into the industrial, com-

mercial and cultural center of a vast new empire."

The absence of a nearby source of coal was a severe blow to early industrial ambitions, as that fuel cost five or six times as much in Los Angeles as in eastern manufacturing centers. However, Nature had in reserve a valuable substitute in the form of petroleum deposits, but man was slow in finding it. The first crude-oil discoveries were made in 1892 by E. L. Doheny and others, and by 1894 liquid fuel was plentiful.

The water problem became acute more than a half-century ago. From the beginning the flow of local mountain streams had to be carefully conserved, and when it no longer met the demands additional water was pumped from wells driven to considerable depths. By 1905, when the population of the city was 200,000, those underground sources were being drawn upon for 4,000,000 gallons daily, lowering the ground-water level at an alarming rate. Engineers who surveyed the water-supply situation at that time predicted that Los Angeles would have 400,000 residents by 1925. Actually, the population had soared to nearly 600,000 by 1920. Fortunately, the city had some far-seeing men who acted boldly and wisely to avert a real emergency. But for them the budding boom would have been nipped before it reached full bloom.

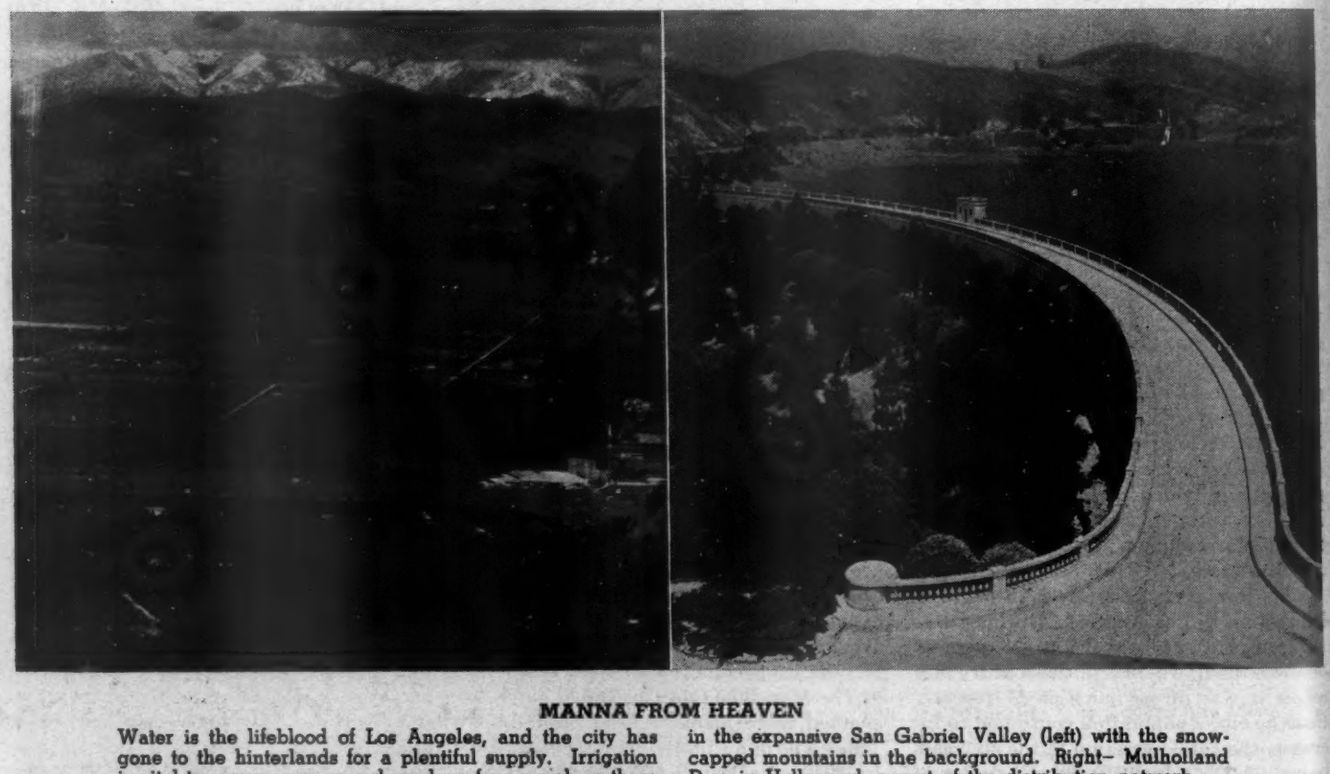
In that same year of 1905, Fred Eaton, a former mayor and city engineer of Los Angeles, proposed getting possession of the Owens River Valley beyond the Sierra Nevada Mountains and piping its waters 233 miles over hills and through the desert. Engineering investigations were carried on quietly, and water rights and rights of way acquired without publicity. The cost of constructing the necessary works to consummate the scheme was estimated at $23,000,000, a tremendous figure at that time. The entire plan was published in the *Los Angeles Times* in July, 1905, and on September 7 the property owners of the city approved a bond issue by a vote of 15 to 1.

The engineers who surveyed and designed the aqueduct were William Mulholland, J. B. Lippincott, and D. K. Parker. Mulholland, as chief engineer of the water department, was the real head, and the Ownes Valley system is generally considered to be a monument to his efforts. As an immigrant lad from Ireland, he obtained work as a *zanjara*, a tender of irrigation ditches, where he watched the surveyors as they worked, studying engineering the while at night. Construction of the aqueduct was begun in October, 1908, and took five years. It involved the acquisition of 135,000 acres of land and the building of 127 miles of railroads, 215 miles of highways, and a cement mill. To carry the conduit through elevated areas, 142 tunnels were driven. The first water was delivered to a reservoir on the outskirts of Los Angeles on November 5, 1913. Called upon to address the 20,000 persons assembled there, Mr. Mulholland uttered five words: "There it is, take it!"

The new aqueduct had a capacity of 280,000,000 gallons daily, increased the total supply of water to enough for 3,000,000 persons. Consequently, there was a surplus available for irrigating crops and for adjacent communities. It was at that time that Los Angeles ruled that no neighboring municipality would be allotted any of the surplus unless it was prepared to amalgamate with the city. Largely as a result of that policy, more than 80 former separate towns or cities are now included within the limits of Los Angeles.

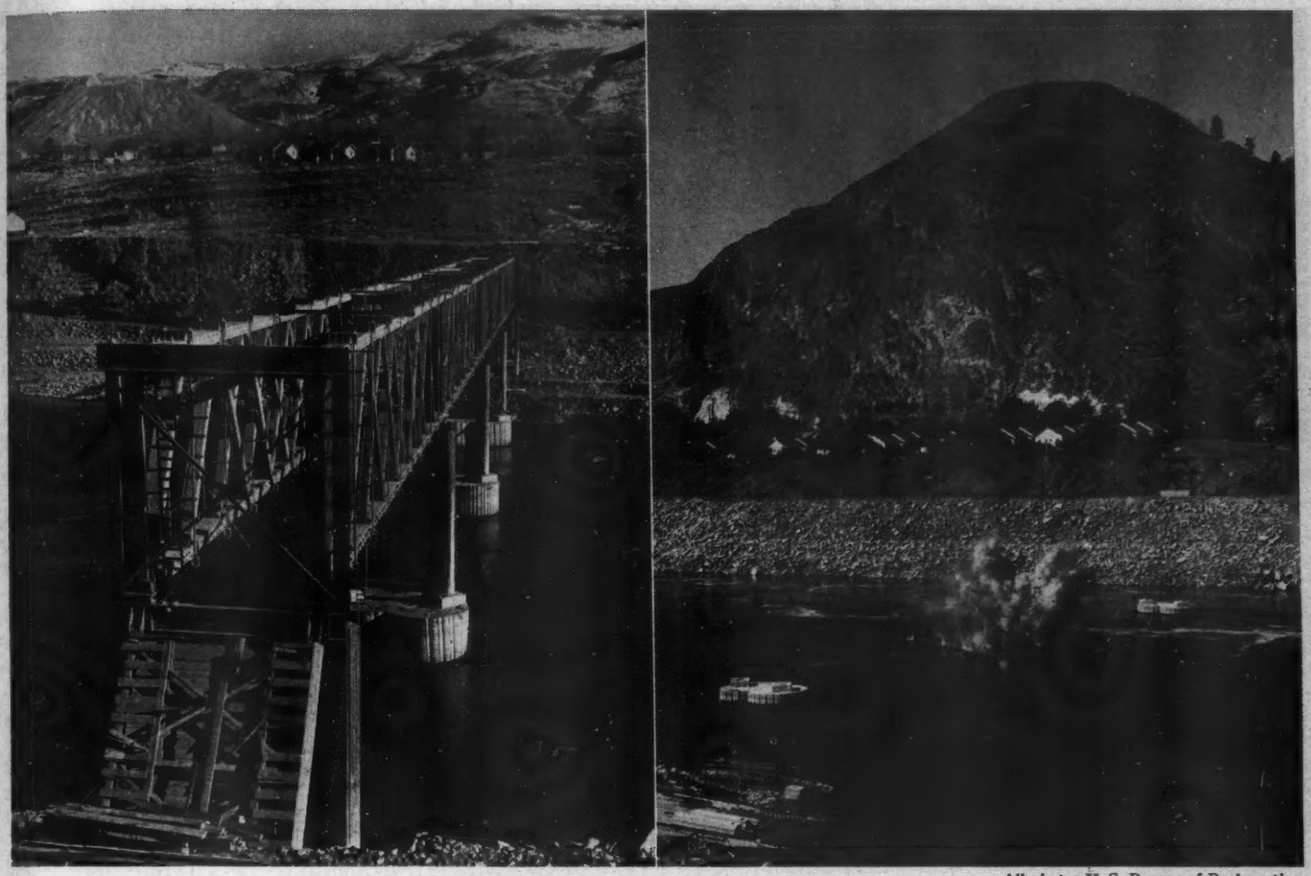
The Owens Valley supply looked very large in 1913, but before long failed to meet the growing needs, and by 1934 wells were again being drawn upon heavily. That time, as is well known, Los Angeles and twelve other Southern California cities banded together into the Metropolitan Water District and went farther afield to bring Colorado River water to them through a 242-mile, $220,000,000 aqueduct. Before that could be done, however, Boulder and Parker dams had to be built and, to bring them into being, the aid of the seven western states having rights to the water had to be obtained and brought to bear upon Congress.

Again there were men of vision to carry on, and among them William B. Mathews stood out. He was special counsel for the Los Angeles Municipal Water and Power Systems from 1907 to 1929 and general counsel of the Metropolitan Water District of Southern California from 1929 until his death in 1931. The storage reservoir at the western terminus of the aqueduct is named Lake Mathews in his honor. The aqueduct was placed in operation on November 19, 1939, and has virtually doubled the water supply in the cities it serves. Boulder Dam has also assured Los Angeles and all Southern California low-cost power for industrial growth.



MANNA FROM HEAVEN

Water is the lifeblood of Los Angeles, and the city has gone to the hinterlands for a plentiful supply. Irrigation is vital to orange groves and produce farms such as those in the expansive San Gabriel Valley (left) with the snow-capped mountains in the background. Right– Mulholland Dam in Hollywood, a part of the distribution network.



All photos U. S. Bureau of Reclamation

NOW YOU SEE IT, NOW YOU DON'T

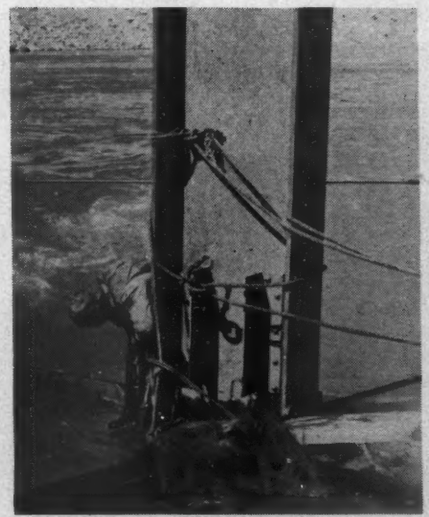
Stripped of its decking and approaches, the construction bridge across the Columbia River is seen at the left just prior to its dismantling. The other picture shows the final blast that blew the central concrete pier to bits to clear the channel for the navigation of light-draft vessels. The two shoreward piers were not removed.

Razing a Construction Bridge

R. G. Skerrett

ONE of the last reminders of those strenuous days when Grand Coulee Dam was being built was the bridge a little way downstream that linked the shores of the Columbia River. Over that crossing during its years of greatest usefulness traveled thousands of workers to and from their jobs and moved immense quantities of essential materials that were incorporated in the stupendous concrete barrier that backs up the waters of the Columbia for more than 100 miles.

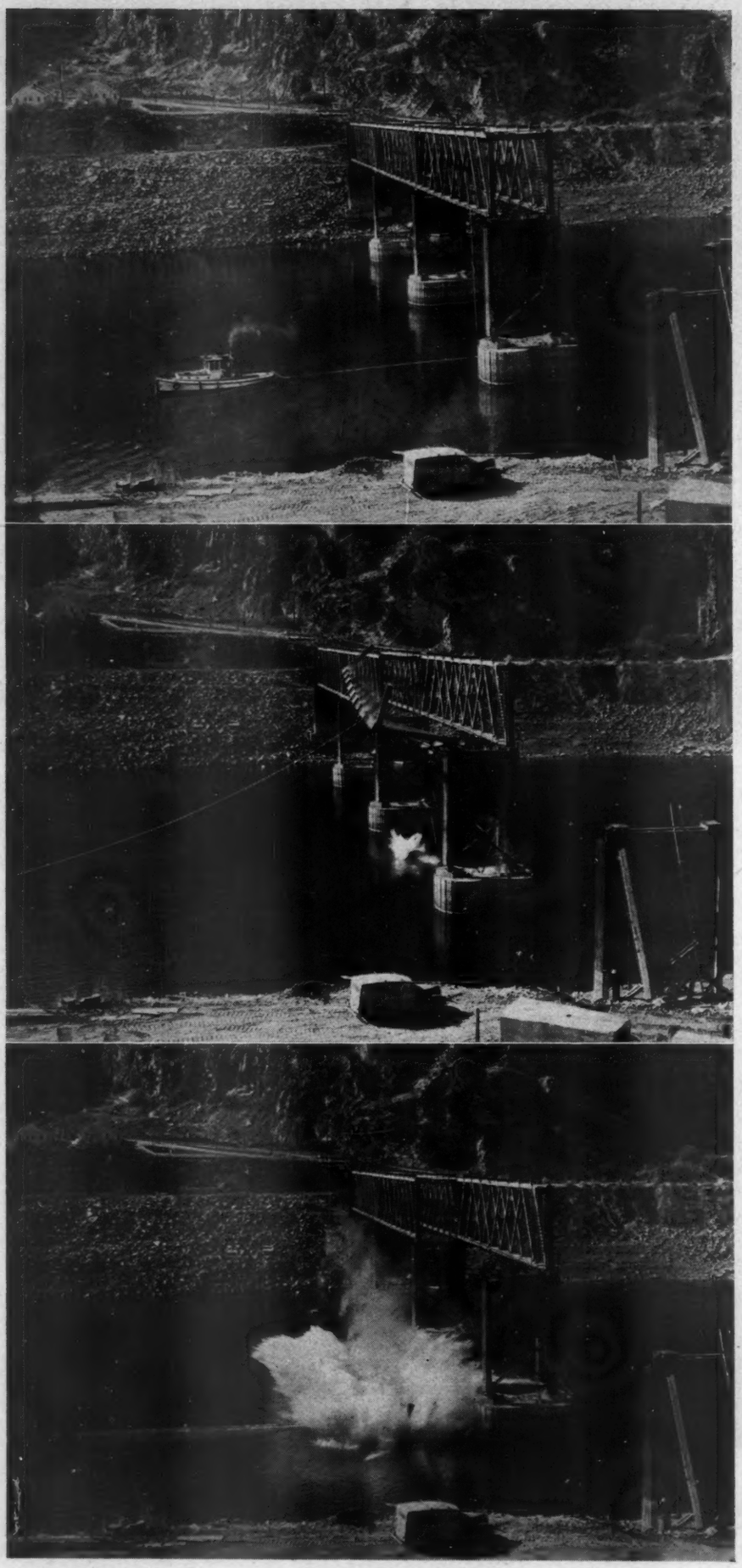
Before that construction bridge ceased to be a vitally necessary route, the U. S. Government spanned the Columbia a short distance farther upstream by a typically up-to-date steel structure for highway service. This occurred when steel was still a somewhat precious commodity because of wartime priorities, and orders were therefore issued to dismantle the old crossing and to salvage all metal with care and dispatch. The superstructure of the span was largely built of timber—of members composed of heavy planks bolted together and interconnected by means of steel straps and tie rods, to mention just some of the metal connections. All these binding and strengthening parts had to be saved and landed at a convenient point on one of the river banks where they could be reclaimed for resale as scrap metal of value to our national security or for immediate or later use in the development project of which the Grand Coulee Dam is the dominant feature.



A TICKLISH JOB

A workman, almost awash, uses a pneumatic tool to cut away the heads of bolts tying the footing of an I-beam column to a concrete pier.

Some of the accompanying photographs give a clear conception of the structural details of the old bridge and also show how it was progressively torn down by the U. S. Bureau of Reclamation. First the superstructure members were disengaged from their sustaining steel towers or bents and dropped clear into the river by a hawser secured to a small power tug, picturesquely dubbed the *Blue Ox*, which then towed them to a landing place where the metal fittings were salvaged. The heavy steel I-beams of the tower legs and their cross-bracing systems were then



dismembered and removed piecemeal with the assistance of a large revolving derrick mounted on a good-sized barge that was suitably equipped for the task in hand.

The dismembering of the steel bents was a 2-stage operation. The first consisted in cutting away the bolts that bound each upright I-beam to its pier footing, with the tower secured the while by a wire-cable sling to a tautened hoist pendant from the tip of the derrick boom. Next, when the last bolt had been severed, the derrick lifted the bent and lowered it on to a waiting barge by which it was towed to the landing place for final dismantling. In this work were utilized various pneumatic tools for running off nuts and for cutting the heads of rivets, as the occasion required.

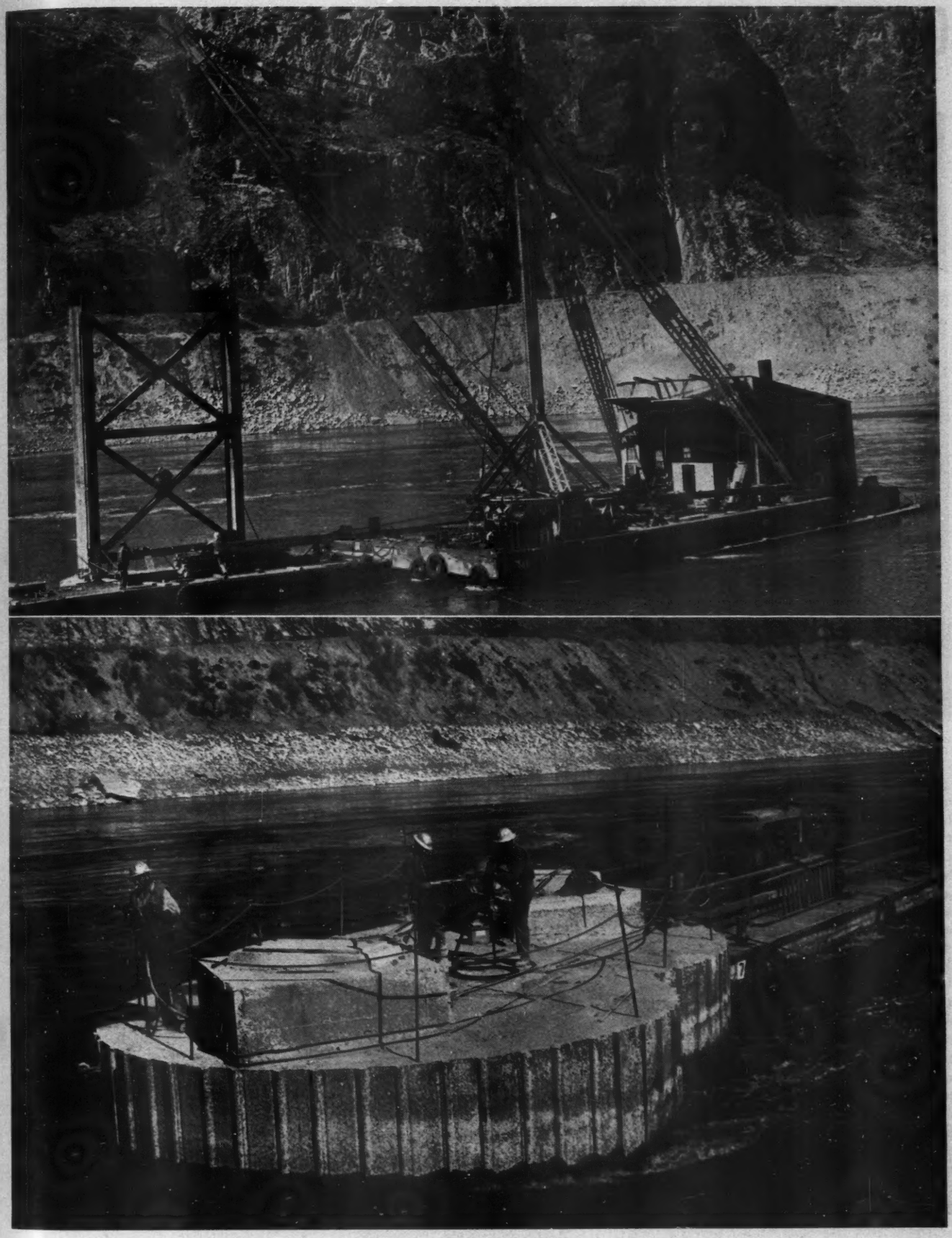
When the last of the steel bents had been deposited on shore, there was still one more job to be done—the demolition of the central pier which rose above the water in midstream. That obstruction had to be cleared away so as to permit the movement of such water-borne craft as would be engaged in channel improvements. The pier, like the two standing closer to the river flanks, was of reinforced concrete poured within two connected cofferdams of interlocking steel sheet piling that had been driven securely into the stream bed.

Removal of the structure was effected by drilling and blasting, crews using JA-55 Jackhamers sinking the necessary number of shot holes for the dynamite charges required to break up the masonry down to a predetermined depth below the surface of the river at low-water stage. Air for the pneumatic drills was furnished by two Ingersoll-Rand portable compressors that were mounted on barges and had a capacity of 315 cfm. each. This concluding work of clearing away the old construction bridge, built by the Mason-Walsh-Atkinson-Kier Company in 1935, was purposely done when the river was at seasonal low level.

The U. S. Bureau of Reclamation is now doing further work on associate features of the Grand Coulee Dam that will be intimately linked with the potentially great development of the Columbia Basin region.

DOWN IT GOES!

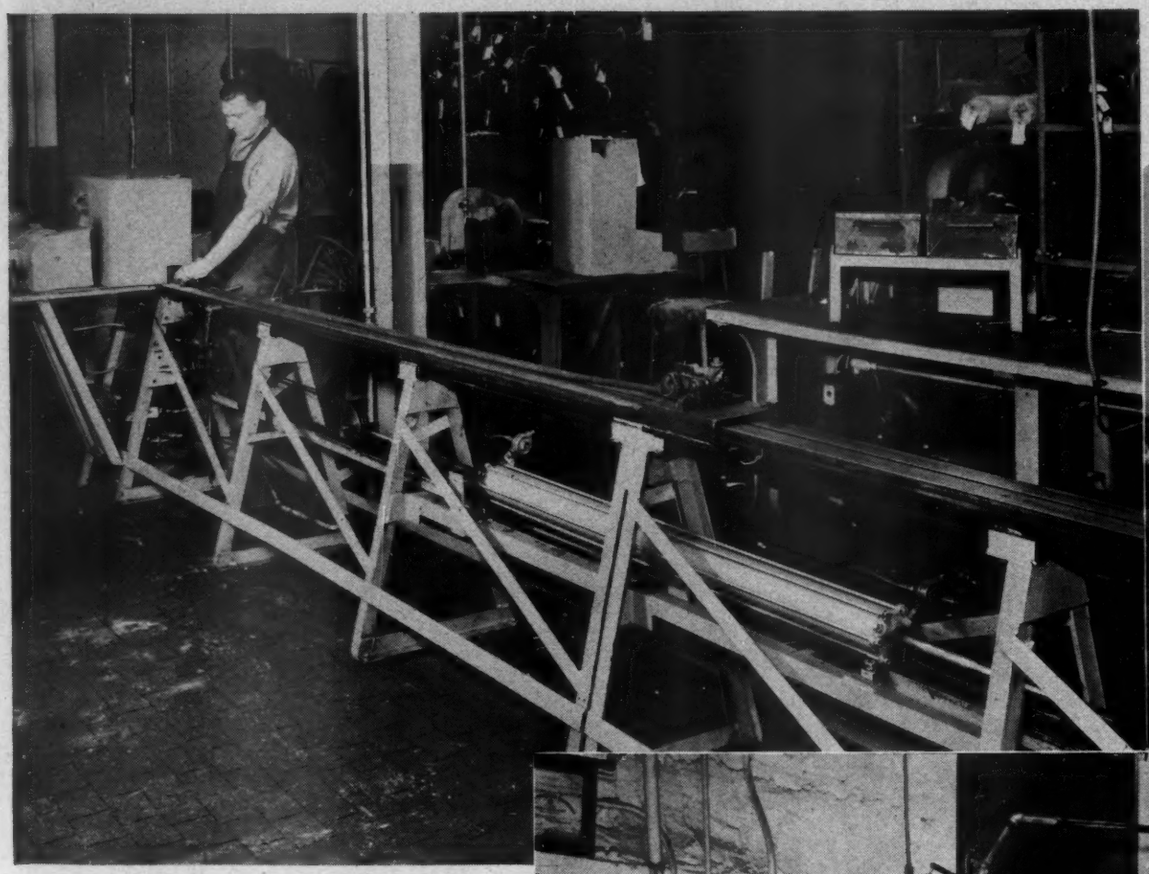
The upper picture, taken after one of the superstructure spans had been removed from the near end, shows workmen on top of a wooden side section sawing through cross members to release it. Meanwhile, the tugboat "Blue Ox" stands by ready to pull the section into the river and to tow it to a beaching site on the near shore. This picture also appears on our cover and is repeated here to give the complete sequence of operations. Center—As the tugboat tautens its tow line the side member goes overboard and riverward. Bottom—The timber structure hits the water with a spectacular splash.



FINAL OPERATIONS

The upper view shows a derrick barge standing by to lift the last tower bent clear of its pier as soon as the footings have been cut free. The drillers in the lower picture are putting in blast holes with Jackhamers preparatory to shattering the central concrete pier. The air is supplied by the portable compressor seen at the right.

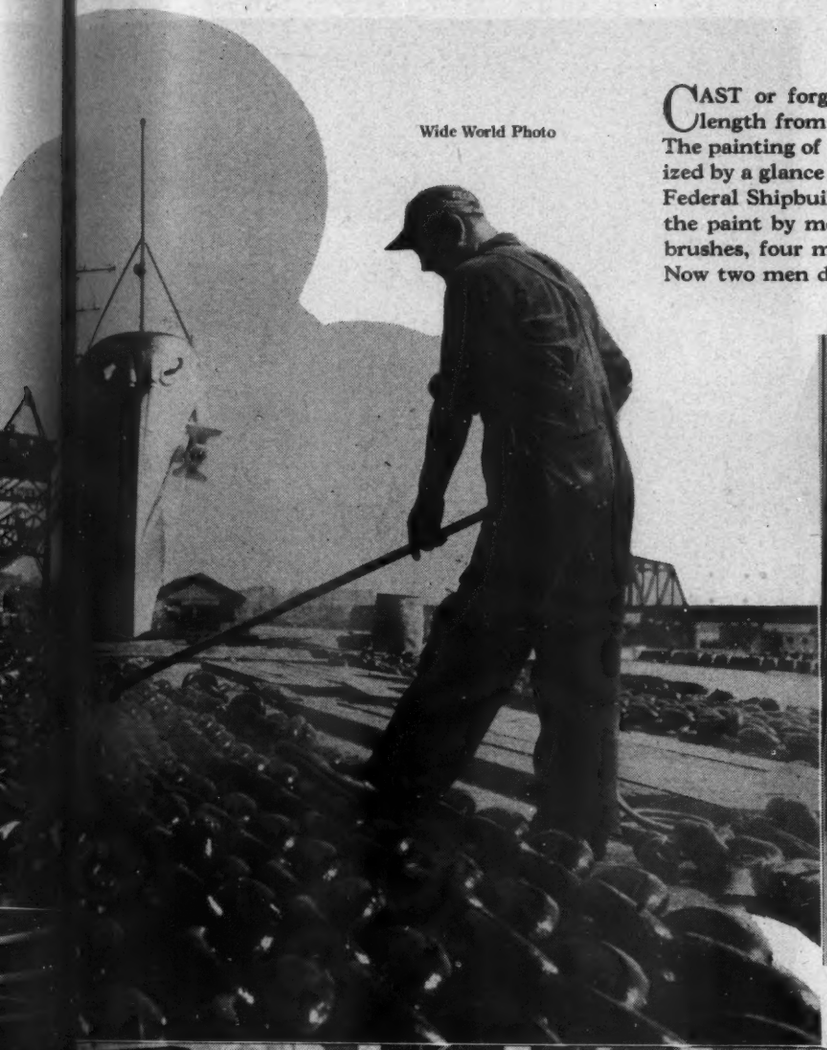
COMPRESSED AIR AT WORK



AT Bendix-Westinghouse's Elyria, Ohio, factory, where automotive air brakes are produced, hose is cut into varying lengths to serve as connecting air lines between tractors and trailers. Considerable time was formerly spent in measuring the hose before cutting it. The machine shown above does that task quickly and automatically. Underneath the bench is a double-acting air cylinder with opposed pistons whose outer ends are connected to a cable extending over sheaves at the ends of the bench and thence in a groove along its top. On top of the bench, near the center of the picture, is a movable carriage with a clamp that seizes one end of the hose as it is fed from a reel in the housing beyond the operator. At the turn of a valve, the carriage starts to pull the hose and moves along until it encounters a stop pin set at a measured distance from the far end of the bench. The operator then severs the hose with a power knife and manipulates the valve, thus returning the carriage to him to duplicate the procedure.

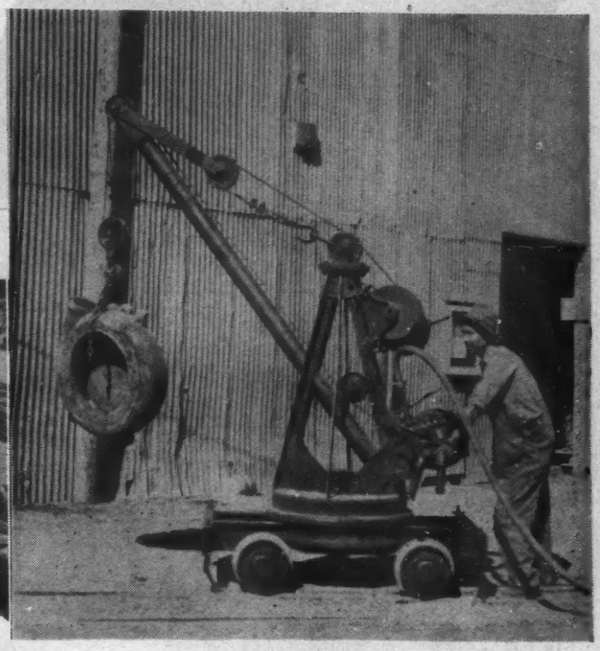
Compressed Air and Gas Institute Photo

A HOMEMADE appliance for cleaning boiler tubes is pictured above. It was made from a shovel handle, pieces of pipe, and some fittings, with a metal disk on the end of the pipe. When the latter is pushed through a tube, the disk dislodges the soot, which is then blown out with compressed air admitted to the device through a connection just above the upper end of the handle. The valve which controls the flow of air is operated by a chain extending down to the workman's hand.



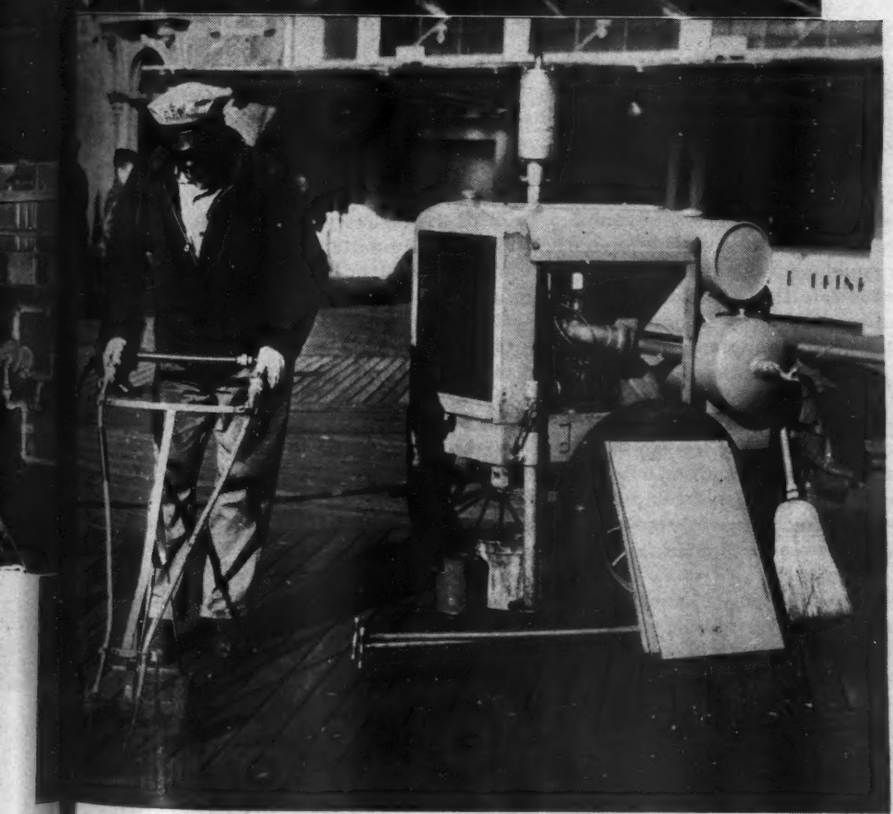
Wide World Photo

CAST or forged-steel anchor chains of deep-sea ships range in length from 50 to 1800 feet, depending upon the type of vessel. The painting of one of the longer ones is a big job, as can be realized by a glance at the picture at the left. It shows a workman at the Federal Shipbuilding & Dry Dock Company, Kearny, N. J., applying the paint by means of a compressed-air spray. Using conventional brushes, four men formerly spent three days coating such a chain. Now two men do it in one day.



Engineering & Mining Journal Photo

TO ease the job of handling heavy objects, the mobile crane shown above was rigged up at the mine of Cia. Minera Asarco at Santa Barbara, Chihuahua, Mexico. It is mounted on a rail car, which has a provision at each end for anchoring it to the rails. Lifting power is supplied by a compressed-air hoist at the rear of the car. A hand-operated winch higher up on the frame controls the boom. The entire upper assembly is free to rotate, thereby enabling the operator to lift or lower objects on either side of the track.



●

ATLANTIC CITY, N. J., has always had difficulty in keeping the cracks in its famous boardwalk free from debris. Experience has shown that this can best be accomplished by pushing through or blowing away the dirt that has become lodged between the boards. To do this, the apparatus shown at the left was devised by Maj. William F. Carey, Commissioner of the Department of Public Works. The two hollow prongs, spaced a board width apart, reach down into the cracks, and a blast of compressed air introduced through them does the rest. The air is supplied by a portable compressor.

Cobalt District Astir After Long Sleep

A. S. Park

COBALT, the mining camp that gave modern Canadian metal mining its initial impetus, is back in the news again after a lapse of 20-odd years. With a total of more than $360,000,000 worth of mineral production to its credit, it has been dormant ever since the price of silver dropped after World War I, reaching a low of 25 cents an ounce. Now, with the United States paying 71 cents an ounce for foreign-mined silver, and with the metal cobalt in demand, steps are being taken to reopen many of the old workings. One company has acquired sixteen of them, in addition to other properties not previously mined, and is rehabilitating them as fast as possible.

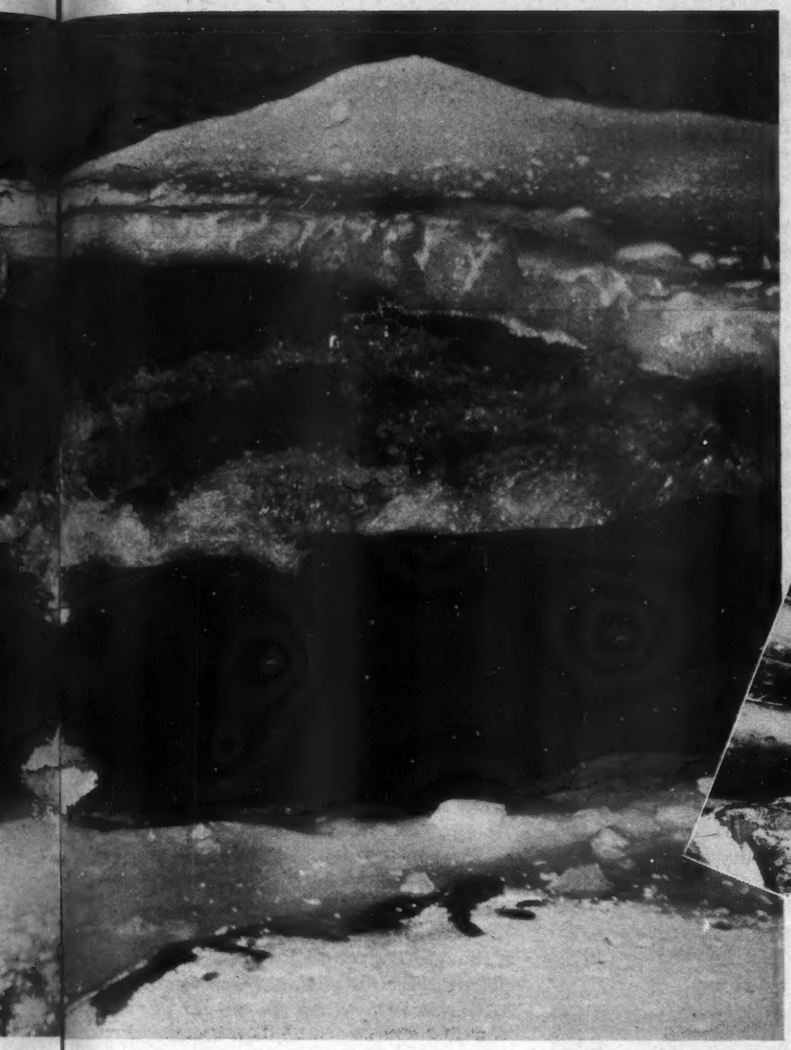
Three of the mines and a concentrating mill are already in operation, and a new electric smelter to recover cobalt, which will reputedly be the largest of its kind on the continent, is being constructed. In the course of the activities, part of a lake has been drained to stop it from again flooding some of the mines, which are now full of water and have to be pumped out. Some of the early miners carried their workings so close to the lake bottom that a blast broke through and precipitated a deluge. That area of the lake bottom was cofferdammed and pumped out to permit sealing the breach in the earth's crust.

There is believed to be much cobalt left in the old mines. It was a comparatively unwanted mineral during the former production era, although the records indicate that all told $25,000,000 worth of it was shipped from the district. In fact, cobalt has come to be highly valued only in recent years. Its anglicized name comes from Kobold, meaning "goblin." Miners of Saxony applied that term to it because of the trouble they had with its ores, cobaltite and smaltite. Both contain arsenic and gave off poisonous fumes when smelted. Moreover, they yielded no silver even though they are of silvery appearance.

Cobalt now has many applications and commands a price of from 80 cents to $1 a pound. It enters into the hard, heat-resistant alloy "stellite" that is used in metal-cutting tools and for which there was a heavy demand during the war. Other alloys containing cobalt are employed in jet engines, turbosuperchargers, and internal-combustion engines because they are highly heat-resistant. Cobalt also finds many other uses in industrial materials and is a component of permanent magnets. From it are made dyes for coloring textiles, glass, ceramics, and paints.

Most of the cobalt consumed in the United States in recent years has come from Northern Rhodesia, Africa. The ore from that source is said to be richer than that from Canada and to offer fewer obstacles to reduction. Shipments of 675 tons from the Cobalt area were officially reported for 1945. The ore contained 228,869 ounces of silver, 128,618 pounds of cobalt, and 75,998 pounds of nickel. The output was divided among sixteen mines.

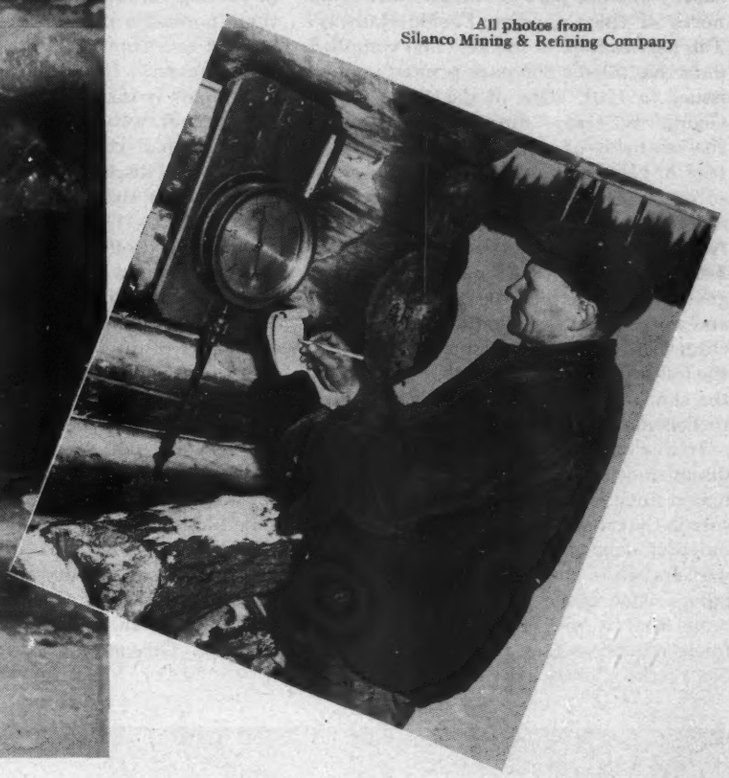
In 1909, during the heyday of the Cobalt district, private interests constructed a hydraulic-compressor plant at Ragged Rapids on the Montreal River and 8 miles from the camp. It furnished compressed air for many of the mining operations and is again being put to similar uses. It is now owned by the Hydro-Electric Commission of Ontario. The plant is one of several that were built on the continent during the same general period. As was true of most of the others,



AIR COMPRESSED BY FALLING WATER

The view in the center shows the whirlpool at the intake of the 351-foot vertical shaft in which descending water compresses entrained air to 125 pounds pressure. The air is released in an underground chamber hollowed out of rock and is piped from there to the surface and thence to the mines of the Cobalt district. When too much pressure builds up, the subterranean receiver blows off in the form of a beautiful geyser that sends spray to a height of 300 feet. A wintertime view of it is above the article heading. Only two men are required to look after the hydraulic compressor and its distribution network. One inspects the pipe lines for leaks and the other reads gauges (below).

All photos from
Silanco Mining & Refining Company



this one was designed by Charles H. Taylor of Montreal. It produces the equivalent of 10,000 hp. of energy.

A 660-foot dam across the river diverts part of its flow into two 16-foot-diameter pipes that carry it to the collar of a vertical shaft 351 feet deep and 9 feet in diameter. Air is drawn in through smaller pipes by suction induced by the rushing water. Thus trapped in the cascade during its descent, it is compressed by the weight of the column above. Forty feet from the bottom, the shaft widens out to a diameter of 11½ feet to assist in liberating the air.

Connecting with the shaft bottom is a tunnel 1021 feet long, 22 feet wide, and about 20 feet high. At one point its height is increased to 42 feet, thus forming an overhead chamber in which the compressed air is stored as it separates from the water. The air has a pressure of about 125 pounds per square inch. Beyond the receiver the tunnel resumes its former height of 20 feet, and as the discharging water fills it entirely, the air is sealed in.

The water rises through a tail shaft and flows back into the river, while the compressed air is conducted to the surface by a 24-inch steel pipe extending through the afterpart of the tunnel and thence up the tail shaft. A 20-inch seamless-steel pipe, laid in 40-foot 3000-pound lengths with flanged joints, conveys the air from the outlet to the mining district where branch lines distribute it to points of application. To prevent damaging movements caused by alternate expansion and contraction, the 20-inch pipe is anchored at half-mile intervals to heavy concrete piers on solid rock foundations. In the line, midway between each pair of piers, is placed an expansion joint that is supported on two rails bolted to wooden ties buried beyond danger of damage from fire or weather conditions. Compressed air is used at the mines for operating hoists and rock drills and also for running pumps that are removing water from the flooded workings at the rate of 1600 gpm.

The renewal of activity at Cobalt kindles memories of its illustrious past, for it was there that Canada's mining industry was nurtured. Aside from it own noteworthy production record, the district stimulated interest in mining, provided funds to widen the search for mineral wealth, and gave practical training to a group of great men who went on to discover and develop Porcupine, Kirkland Lake, and other rich fields. These men fanned out from Cobalt in ever-expanding circles and laid the foundation for the present concerted mining activity that is gradually reaching toward the northern borders of the country.

In widely separated areas that were outposts of civilization until the airplane came into service, the great pre-Cambrian shield is yielding showings of ore that are worthy of development. During the war years, these budding mines were prohibited from doing underground exploratory work. Consequently, and perhaps fortunately, they had to content themselves with probing for hidden veins with diamond drills. Thousands of miles of holes were bored into the ground, and from them were extracted cores that give the best evidence of mineralization short of actual mine openings. Now, with wartime restrictions removed, showings on more than 40 properties warrant shaft-sinking, and it is generally conceded that Canada is on the threshold of an era of vast mining activity. No one can foretell just what will be the outcome, but

there are men of standing in the mining industry who believe the Dominion will one day lead the nations of the world in the production of metals.

Although it is only about 300 miles north of Toronto, the region in which Cobalt lies was classified as unexplored territory until a little more than 40 years ago. Just prior to 1900, the Ontario Government voted $40,000 to explore and survey all that part of the province lying north of the Canadian Pacific Railway. Ten parties took to the field and compiled data that filled a 300-page printed volume issued in 1901. One of the party heads, George R. Gray, directed attention to the resources of what was then the District of Nipissing, and men of vision were so impressed that they fostered a movement to build a railroad northward from North Bay to the northern end of Lake Temiskaming. After a lengthy debate, the government provided the necessary funds, and work on the Temiskaming & Northern Ontario Railway was begun in 1902. By the following August the rails had reached the shores of Lost Lake, which was later to become Cobalt Lake.

It was at this juncture that silver was discovered, but just how is shrouded in uncertainty. The only thing known for sure is that it was purely accidental, inasmuch as deposits were found by railroad workers while carrying out their prosaic labors. One apocryphal story is so glamorous that it will not down and is now freely offered as fact. It recounts that a blacksmith named Fred La Rose one day threw a piece of steel at a fox that ventured near his forge. The missile missed the fox but chipped a piece of ore from a nearby outcropping vein. Luckily for La Rose he was a frugal man, and when he went to retrieve his steel he discovered the ore.

A more likely tale attributes the initial find to two workmen, James H. McKinley and Ernest Darragh, who were engaged in cutting railroad ties. One day one of them noticed a piece of white metal embedded in a timber they had snaked out of the forest. It was native silver, and they knew it must have been picked up by the soft wood somewhere along the way they had traveled. Retracing their route, they discovered the vein and located claims that subsequently became the McKinley-Darragh Mine.

It is an established fact, however, that La Rose found mineral, regardless of whether or not the fox had anything to do with it. The records show that he filed proof of discovery on September 29, 1903, just a week prior to the filing by McKinley and Darragh. La Rose, who apparently had some knowledge of mineralogy, did not seem much impressed with the native silver that he had picked up; instead, his interest was in another mineral in the vein which he thought contained copper. He gave samples of it to Thomas Gibson, deputy minister of mines for the Province of Ontario, who recognized the mineral as niccolite, the arsenide of nickel. Gibson sent a piece of it to Dr. W. G. Miller, the provincial geologist, and the latter left at once for the area whence it came. From La Rose's vein he pried out a chunk of silver a'most as big as his hand. When he exhibited it in Haileybury that night it precipitated a rush to the district. Many claims were staked, including one that became the O'Brien Mine, which is conspicuous in that it remained in production through the lean years when all other Cobalt mines were forced to close down either because of the declining silver price or ore exhaustion.

After the first flush of excitement had passed, the Cobalt boom temporarily subsided because the general public showed surprisingly little interest in the whole affair. Even some mining men had doubts concerning the ultimate value of the deposits, being inclined to consider them as freak occurrences that wou'd play out with depth. Meanwhile, a few prospectors went about the business of developing their claims, and by 1905 had obtained results that convinced everyone that Cobalt was destined to become a real mining camp. The rush began anew and this time it was overwhelming. Whereas only four companies had been incorporated in 1904, the number rose to 203 in 1906, and eventually there were more than 600. The country was staked for miles around and everybody dreamed of riches.

Fanned by the breezes of optimism, Cobalt grew and prospered. Ore yielding 10,000 ounces of silver to the ton was not uncommon; and besides there was cobalt, although that mineral was then not much sought after. The banner year for the district was 1911, when the output of silver was just short of 30 million ounces. Production remained high until 1913, when it declined sharply. Gradually at first, and then more rapidly, Cobalt declined until only the O'Brien Mine was operating. However, many of those that left Cobalt went on to other areas to develop mines that have contributed importantly to the wealth of the Dominion. There are numerous illustrious names among the group, including those of Noah and Henry Timmins, whose interests spread out to various camps; Henry A. Kee, who sank the first deep shaft in northern Ontario at the McIntyre-Porcupine Mine; Fraser Reid, who became manager of the Howey Gold Mine; John E. Hammell, who was later to be identified with at least four large mines; and Robert T. Jowsey, who discovered the Keeley Mine.

And now the fickle tides of economic demand and supply are washing on Cobalt's shores again. Stores are reopening, and 60 houses are being refurnished as dwellings for miners. Pay envelopes, rarities for almost a quarter-century, are being distributed. No one expects the old camp to approach its former place in the sun, but it will not be surprising if it yields a considerable quantity of ore before it comes to that inevitable end that awaits every mining community.

GOING UNDERGROUND

Day-shift miners entering a skip that will lower them 1200 feet in the Temiskaming Mine. The mine hoists of the district are operated with compressed air.

CANADIAN ASBESTOS

CANADA possesses the largest deposits of asbestos known and normally supplies about three-quarters of the world's requirements of that mineral. Annual production ranges in value around $20,000,000, and the demand was steady during the war period despite the loss of overseas markets. The principal deposits are in the vicinity of Thetford Mines, Quebec, and have been worked since 1878. The nine mining companies that are now active there employ approximately 4000 men. Most of the ore is milled locally, and the asbestos is exported to the United States for processing. In 1944 nearly $2,000,000 worth of asbestos products were shipped back to Canada.

Technically speaking, true asbestos is confined to five varieties of the mineral amphibole, but the industry uses the word to mean any crystalline rock that can be separated into fibers suitable for spinning or felting. Most of the Canadian production is in the form of chrysotile, which has the same composition as serpentine and is invariably associated with it. Chrysotile is the favored mineral because it yields the finest and longest fibers. Other minerals that are mined sparingly are amosite and crocidolite, or blue asbestos. Certain varieties of amphibole, or true asbestos, also exist in Canada, but they produce a grade of asbestos that has limited usefulness.

The chief commercial virtue of asbestos is, of course, its resistance to fire. Curiously enough, its name comes from a Greek word meaning "unextinguishable." The ancients applied it to a stone that burned with a fire that could not be quenched, probably unslaked lime. The spinning qualities of asbestos were undoubtedly discovered many centuries ago. Plutarch mentioned "perpetual" lamp wicks used by the Vestal Virgins, and shrouds made of woven asbestos appear to have been worn for cremations. Pliny referred to them as "the funeral dress of kings."

Thetford Mines is in a part of Quebec that is known as the Eastern Townships because it was divided into approximately square townships when it was surveyed in 1791, whereas previously settled areas had been laid out in the form of long, narrow subdivisions. The first home seekers entered the section around 1800, making difficult journeys through forests and swamps. The district was isolated from the rest of the world for many years and the residents, lacking money, gave potash in payment for purchases. It was obtained from the ashes of hardwood trees that they cut and burned.

The Indians who first occupied the site of Thetford Mines called it Namesokantic, meaning "place full of fish." The white settlers named it Kingsville, for William King, who was an early proprietor of asbestos mines. When the community was incorporated in 1905, it received its present name, which had previously been given the township and which had been taken from a town in England.

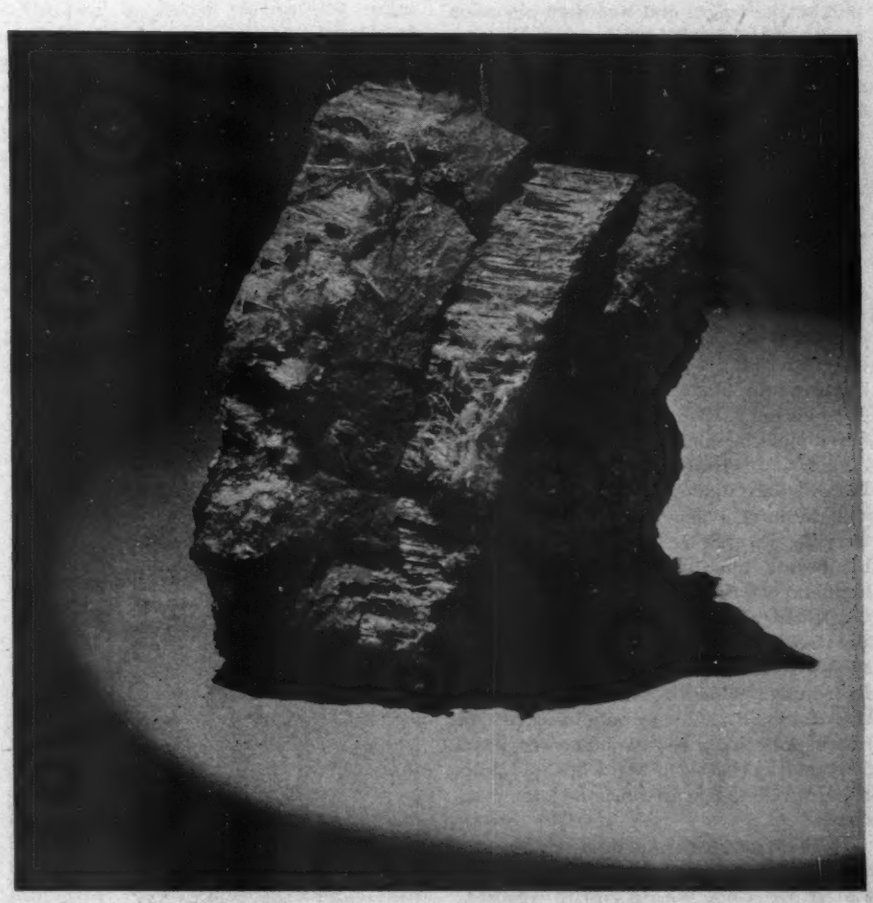
Sir William Logan, first director of the Geological Survey of Canada, noted asbestos in the Eastern Townships in 1847, but no development work was done at the time. In July, 1876, Joseph Fecteau came upon some of the peculiar mineral and showed Peter Ward how easily he could separate it with his fingers into white threads that were smoother than silk. Ward had the stone analyzed, and production was begun two years later.

The chrysotile exists as veins in serpentine. The fibers lie crosswise of the veins, and the width of the vein therefore determines the length of the fibers. Most veins are less than 2 inches wide, but occasionally they reach 3 or 4 inches. The vein is usually divided almost in the center by a thin seam of magnetic iron ore. Thus a 2-inch vein yields fibers only 1 inch long. The mineral is hard and rock-like, but has a smooth feel. When rubbed by the fingers, small fibers can be detached and "teased" into a soft, silky mass.

Seeking to explain the formation of asbestos, geologists infer that the film of iron ore found in the vein marks the course of a crack in the original rock. It is supposed that vapors or hot water circulated through the crevice and transformed the rock on either side into serpentine. It is further assumed that the serpentine immediately adjacent to the crevice took on the crystalline, fibrous form, while the rest of it remained massive.

Until a few years ago, all asbestos was quarried from open pits that attained surface areas of as much as 1000x500 feet and depths of from 300 to 400 feet. Core drilling to depths of more than 1700 feet disclose the persistence of the veins with fibers equal in quality to those now being extracted. In 1934, the King Mine of the Asbestos Corporation Limited was carried underground, and several other producers have followed suit or are sinking shafts preparatory to doing so.

In the King Mine, the use of wood underground is prohibited. Props, chutes, and railroad ties are of concrete, steel, or other hard materials, and even the surveyors' plugs are of metal. The reason for this is that a piece of wood the size of a match may cause the rejection of a quantity of asbestos. Splinters in the long-



SPECIMEN OF HIGH-GRADE CANADIAN ASBESTOS

fiber material used for spinning may damage the machinery that handles it. Since the ore that is concentrated is milled in a dry state, any wood that is present will remain in the asbestos throughout the separation process.

Although wider veins occur, most of the output consists of fibers from ¼ to ½ inch long. Rock containing fibers long enough to be separated by hand (¾ inch or longer) is hand-cobbed by skilled workers. The product, which is called "crude," seldom amounts to more than 4 or 5 percent of the material recovered, but represents from 20 to 25 percent of its total value. From 70 to 80 percent of the rock brought to the surface is treated in concentrating mills. After being dried, it is crushed several times. After each crushing it is screened, and the asbestos that has been liberated is drawn off by suction induced by fans. The segregated material is screened several more times to remove dust and to classify the fibers as to length. The milling art has been developed to a high degree of efficiency through the many years it has been practiced. As a result, it is profitable to handle rock that contains only from 5 to 10 percent of asbestos and that is worth from $2 to $3 per ton.

Asbestos is used principally for making insulation of various kinds, soil pipe, shingles, brake linings, clutch facings, millboard, and fireproof curtains. An asbestos fabric reinforced with glass fiber, produced in 1944, has greater strength than plain asbestos cloth and is in demand for insulating purposes.

This and That

Unusual Industrial Incidents

Two items appearing in the recent industrial news differ from run-of-the-mill reports. One of them concerns a woman who spent 48 years working for The Goodyear Tire & Rubber Company and came to be known as the "First Lady of Goodyear." She was Clara Bingham, and her death on May 23 brought out the story. Born 75 years ago in Ohio, Miss Bingham attended Lake Erie College, and in the fall of 1898 answered a want ad in an Akron newspaper that led to her employment as a secretary in the newly founded Goodyear factory. Later she served as assistant purchasing agent, and was then placed in charge of the firm's welfare work. Eventually she became director of all women's activities and organized musical, dramatic, literary, social, and athletic programs for members of her sex. Several years ago she was named company librarian, a post she held until her death. She piled up the longest service record of any Goodyear employee.

The other item explodes the theory that nothing is ever done in the modern corporate business world without a written contract. In 1919 the Hagan Corporation, of Pittsburgh, Pa., developed combustion-control equipment that was described in our February, 1946, issue. Because it was outside of the company's established line of activity, arrangements for its manufacture were made with B. G. Cope who was running a general machine shop in Orrville, Pa. Since then the equipment has been applied to 7200 boiler plants on land and 600 on shipboard. Now, after 27 years, Hagan Corporation is taking over the Orrville plant, which has been operating as a unit of the Willburt Company. In connection with the acquisition, it was disclosed that the only basis of the relations between the two concerns was a conversation between Mr. Cope and John M. Hopwood, Hagan Corporation's president.

In 1940, on the twenty-first anniversary of the arrangement, Mr. Hopwood presented Mr. Cope with a cup to celebrate the success of the two concerns and of their "gentleman's agreement." At that time Mr. Hopwood stated: "There have been innumerable opportunities for misunderstanding, price quibbling, alibis, and many things resulting from the 'baby sickness' of a business in the making. Yet up to this day I have never exchanged an unpleasant word with Mr. Cope. Yet there has been no contract to avoid the pitfalls that can affect such a relationship. Have we been wrong? I do not think so, for in all the years of our association there has never once been felt the need for the scratch of a pen."

★ ★ ★

Safer Coal Mines

Accidents in coal mines have been reduced by one-half during the past twenty years, according to the Bituminous Coal Institute.

Most of the credit for this record is ascribed to the introduction during that period of more than 100 different safety devices, machines, and methods at a cost exceeding $100,000,000. One of the major changes has been the substitution of permissible explosives for the black powder and dynamite that were formerly used. Unlike the latter, the detonation of these modified safety powders results in less flaming and lower temperatures that are said to have reduced one of the major hazards of coal mining by 50 percent. Coal miners are the largest peacetime consumers of explosives, and there are now available some 180 permissible brands that meet the standard approved by the U. S. Bureau of Mines.

Other notable safety measures are the use of electric lamps instead of the oil or carbide types, and the introduction of hard hats, hard-toed shoes, and safety belts. More than twenty automatic signals, alarms, and gauges are utilized to record water pressures, detect the presence of gases, break electrical circuits, and otherwise afford instant protection from operating hazards. The incidence and spread of underground fires have been decreased sharply by the extensive employment of calcium chloride for allaying coal dust, by fireproofing ventilation guides, shaft lines, mine entrances, etc. Systematic timbering has reduced the falls of slate or rock from roofs. The first safety director in a coal mine was appointed in 1910; today every major coal-mining company has on its staff one or more specialists in accident prevention.

"IT WAS AN ACCIDENT
YES, THEY SELL SAFETY SHOES
NO, I DIDN'T BUY A PAIR
YES, I WISH I HAD
NO, THEY AREN'T EXPENSIVE
YES, IT HURTS
NOW BEAT IT!"

★ ★ ★

Target Range Miner

When Uncle Sam tore Johnny Ballance away from his mining job in the Southwest and put him in a G.I. uniform, he started an interesting chain of events that launched Johnny in a strange sort of mining business. Assigned to the Air Corps, Ballance spent some time at a gunnery school outside Las Vegas, Nev., where the embryo flyers peppered bird shot at clay pigeons to train them to hit moving targets. He figured that quite a lot of lead was being shot into the desert, and in the course of some spare-time prospecting determined that the pellets didn't penetrate much beyond the surface of the ground. When his war service was over, Johnny asked for a lease on the former shooting range. The Government said he would have to com-

pete for it, and asked for public bids. Several mining companies sent experts in to look things over, but they submitted discouraging reports, estimating that there was no more than a ton of lead to be recovered.

So Johnny got the contract and started work with a crew of ex-G.I's. With shovels, they loaded the top layer of sand into trucks and hauled it to a homemade separator that Johnny had rigged up. An integral part of this mechanism was a compressed-air jet that blew away the sand but left the heavier shot. There were also some screens and a water line, but the final separation was accomplished with air supplied by a small gasoline-engine-driven compressor.

Johnny's computations proved to have been better than those of the mining experts, for the desert gave up an even 200 tons of lead. This was sold at six cents a pound. The Government took a royalty of half a cent, and 1½ cents went to pay

"He was always jumpin' the gun around quittin' time."

the crew. Ballance's share was four cents, or an aggregate of $16,000. At present he's looking over the rifle, revolver, and machine-gun ranges of the country and may be applying for another lease any day now.

★ ★ ★

Noise Annoys No One

Under the heading "Sweet Music," the *Vancouver* (British Columbia) *News-Herald* of May 30 printed the following on its editorial page:

"Two business men the other morning were heard to complain bitterly about the noise made by pneumatic drills working on the street outside their office windows. As a matter of fact, it is a sound which has been sadly missed in Vancouver for many years. Those drills were tearing up the last sad remains of what was once a paved street.

"You don't have to throw your memory back very far to recall the mounting wail of criticism as Vancouver's streets, lacking manpower and material, became a menace to vehicles and pedestrians alike, and a public disgrace.

"Today the civic board of works has men at work and material on hand and slowly—but we hope surely—the main downtown streets are being returned to better condition. The noise of those drills at work should be music to the ears of every person who has to use the streets. And who doesn't?"

★ ★ ★

"Stops" Whirling Objects

By means of a newly designed instrument known as the Rotascope, any rotating object can be made to appear motionless. It was created by General Electric Company engineers for use in studying airplane propellers under operating conditions. Although a fan blade or similar rotating part can be "stopped" by the Rotascope, any flutter or vibration is seen by the eye, thus enabling engineers to observe just how a blade acts under the strain of revolving at high speed. G-E research workers call the new instrument the "optical engineer."

★ ★ ★

Use For Coffee Grounds

Housewives may some day be asked to husband coffee grounds, just as they are now implored to save waste fats. Svein Dahl-Rode, of New York City, has listed for licensing or sale a patent he holds on a method of treating coffee grounds so that they may be utilized for softening water. Although it is not known definitely why they exert this action, extended experiments have proved that when they are given the prescribed treatment they are effective for the purpose mentioned. The inventor claims that his process can be used in association with almost any type of water-softening equipment to refine water for drinking and for boiler plants and laundries. and other industrial applications. The coffee grounds are first treated with an acid and then with a solution of an alkaline-alkali metal compound.

★ ★ ★

Pipe-Line Corrosion Research

Corrosion of underground pipe lines in the United States necessitates replacements that cost $200,000,000 annually, according to the National Bureau of Standards. In an effort to reduce this huge economic loss, the Bureau has carried on an investigation for the past 25 years. Some of its conclusions have recently been printed in circular form. Because soil characteristics and conditions differ widely, it has been found impossible to correlate corrosion with any

"Brought my wife along. Housin' shortage, you know."

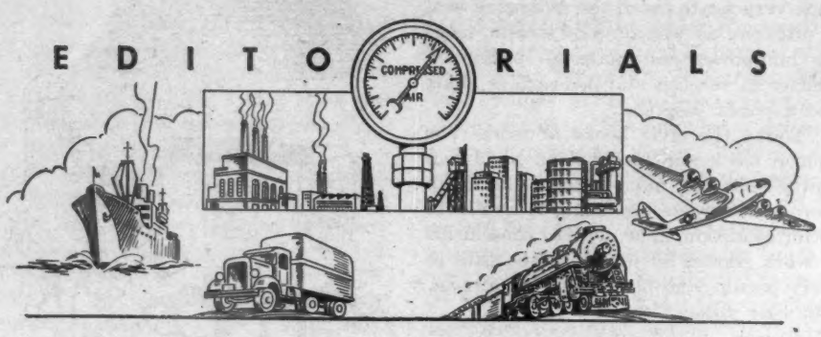
single soil property. Similarly, no one pipe material or protective coating is effective under all conditions. The studies indicate that there is little difference in resistance to corrosion among the ferrous-pipe materials in common use, but ferrous alloys containing nickel and chromium are definitely superior. Copper and alloys with high copper percentages corrode more slowly and uniformly than ferrous materials. Lead resists many soils, but pits deeply in some of them. Likewise, no single pipe coating is equally effective in all soils. Bituminous coatings retard corrosion at a rate that is roughly proportional to their thickness, but few of them are free from pinholes. Furthermore, they are often damaged while the pipe is being laid. It has been found that cathodic protection is a corrosion retardant under most soil conditions, and is now widely applied.

★ ★ ★

Germans Used Poor Iron Ores

To reduce her dependence on high-grade foreign iron ores, Germany invested a billion Reichsmark in the Hermann Goering Steel Works that was built to produce steel from low-grade domestic ores. The established steel industry objected so strenuously to the erection of the plant that Goering lent the prestige of his name to the venture and sponsored the project. The government supplied most of the money, with only a few preferred shares allotted to individuals and private concerns. The mill is reported to have made satisfactory steel by using involved processes in preparing the ore, and many metallurgical problems were solved by maintaining close coöperation between the blast furnace and the steel-making departments. Armor plate, gun tubes, and shells were produced from the steel, and a section of central and northern Germany was supplied with electricity generated by using blast-furnace gas as fuel.

EDITORIALS



ENGINEERS IN A NEW ROLE

HAVING demonstrated that there is practically no limit to their ability to build or rebuild inanimate structures, engineers are now turning their talents to reconstituting the human body. The appalling loss of limbs by participants in the recent war has served to emphasize the previous lack of serious study of the problem of supplying amputees with effective prosthetic devices. In an effort to correct this regrettable oversight, the Surgeon General of the U. S. Army has asked the National Research Council to set up a committee on prosthetic devices. This has been done, and its membership consists of three orthopedic surgeons and three engineers.

It is believed that engineers can help to bring about better artificial limbs by developing materials that are strong, light, waterproof, and easily formed; by devising simple methods of fastening the parts together; by designing an artificial knee that will bear load while flexed and a hand that can be manipulated to give it greater usefulness; and by contributing fundamental knowledge of biomechanics and determining the most essential motions and associated forces.

One of the subjects under consideration is the possibility of supplying artificial hands with some source of power to manipulate them in simulation of natural motions and functions. One of the suggested means of doing this is the use of small cylinders of compressed gas such as are employed to recharge soda-water syphons. Calculations have indicated, however, that with the valves now available the gas would be expended so wastefully that the wearer could not carry an adequate supply.

The conventional material of which artificial limbs have been made is wood, usually willow, covered with rawhide. Plastics have been adopted more recently, and in 1912, when Marcel Desoutter lost a leg in an airplane accident in England, he and his brother devised a substitute fabricated of duralumin. Magnesium has not been acceptable to date because it presents a corrosion problem that has not been solved.

One of the things the committee is working on is the standardization of artificial limbs to bring down the manufacturing cost. As a starting point, measurements have been taken of thousands of persons in an effort to determine a few standard sizes that would be suitable in most cases. In this connection it is noted that, in addition to the thousands of amputees among service men who must be supplied with prosthetic devices, there are between 25,000 and 40,000 amputations in an average year among the civilian population of the country.

In attacking this human engineering problem, technologists are citing that engineering is frequently defined as the application of the forces and materials of nature for the benefit of mankind. Clearly, this definition embraces the worthy cause in which they are now engaged.

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A NEW PROSPECTING AID

IT IS believed that prospecting for metals and oil-bearing structures will be greatly aided by a wartime development of an airborne magnetic detector that was used with telling effect in locating enemy submarines. It represents an amplification of the magnetometer method that has been employed in surface geophysical investigations for many years. Installed on the wing of an airplane or the belly of a dirigible, the sensitive detector reacted to the magnetic qualities of a submarine below. This reaction was transmitted to a needle on the instrument board, thus apprising the crew of the U-boat's presence. By circling the spot and watching the needle's movements, the pilot was able to get directly over the target for a bomb attack that was almost certain to find its mark. It is now revealed that the device was to a large extent responsible for putting an end to the submarine menace in the Mediterranean Sea.

Prior to putting the detector into antisubmarine service, the militarists tested it in a search for iron-ore deposits in Michigan and New York. They also mapped some 40,000 square miles of terrain in this country and Alaska. Since the war ended, it has been put to use by prospecting parties notably in Canada, where it is being installed on helicopters. These craft can hover over areas that give reactions, and thus permit making more thorough investigations. The device is effective in locating structures that are favorable to the existence of petroleum and has the added virtue of being capable of locating them or iron ores offshore in relatively shallow tidewaters.

The Bell Telephone Laboratories, Columbia University, and the Gulf Research & Development Company coöperated with the Naval Ordnance Laboratory in developing the detector. It is so sensitive that extreme precautions had to be taken to guard against the influence of magnetic objects while the research work was being carried on. Confusion was caused when a woman laboratory worker neglected to inform other staff members that one of her fingers still contained a piece of needle that had been embedded there some years ago.

The air-borne magnetic detector will not put the old-fashioned prospector out of business, but it will save him a lot of lost motion. Areas that are indicated to be promising will be covered in detail by land parties.

•

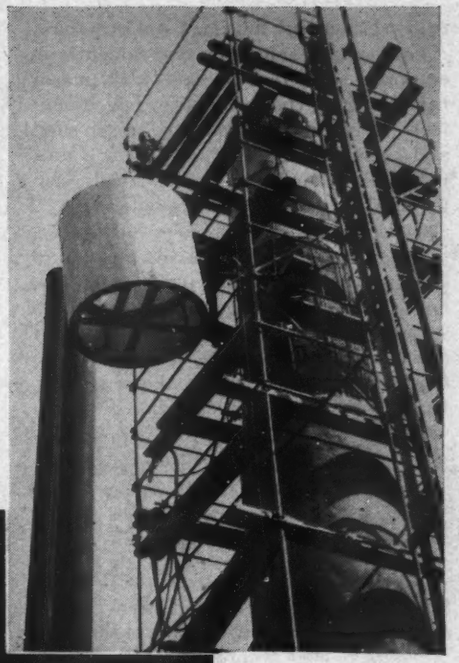
PROGRESS IN THE DAIRY

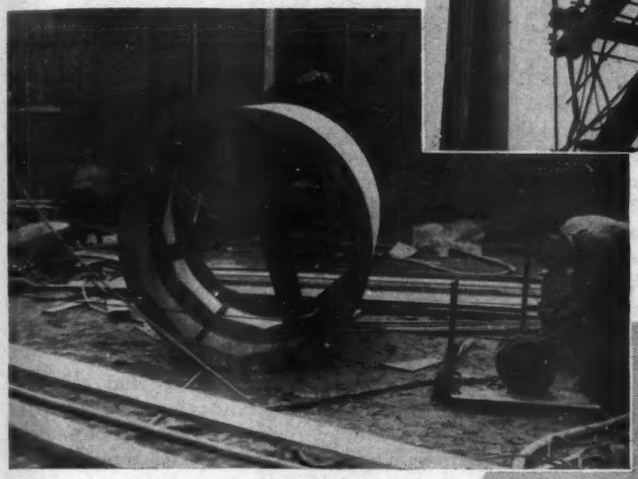
WITH present shortages of food making everyone more conscious than ever before of all phases of the subject of edibles, there is bound to be interest in reports that German scientists have worked out improved processes for making several dairy products. Chief among these is a method of pasteurizing milk with ultraviolet light while at the same time enriching its Vitamin D content. British investigators saw a pilot plant in operation at the Institute of Bacteriology in Kiel, but they did not have an opportunity to check the claims made for its effectiveness by the Germans.

The apparatus employed was an aluminum-sheet cylinder within which was spiral quartz tubing more than 300 feet long and having an inside diameter of approximately 4/10 inch. The milk passed through the latter while the cylinder was flooded with ultraviolet rays from eight tubes. The equipment was capable of treating 100 gallons of milk an hour. In other countries where pasteurization of milk with ultraviolet light has been tried, it has failed because of the low penetrability of the light into the milk. It is thought that the Germans may have overcome this obstacle by using longer tubing.

Other developments attributed to German technologists are a method of making Hollander and Tilsiter cheese in only 80 minutes, as well as machines that produce butter continuously. The latter are now being tested by the American Butter Institute to determine whether they will make butter that meets American standards.

Building a Smokestack in Reverse Order





FORM SECTIONS

The two top pictures show the structural features of the 6-foot plywood sections of which the forms were constructed. These units, as well as the building material for the scaffolding and elevator by which the men reached their working stations, were raised by the I-R air hoist seen at the right in the view directly above.

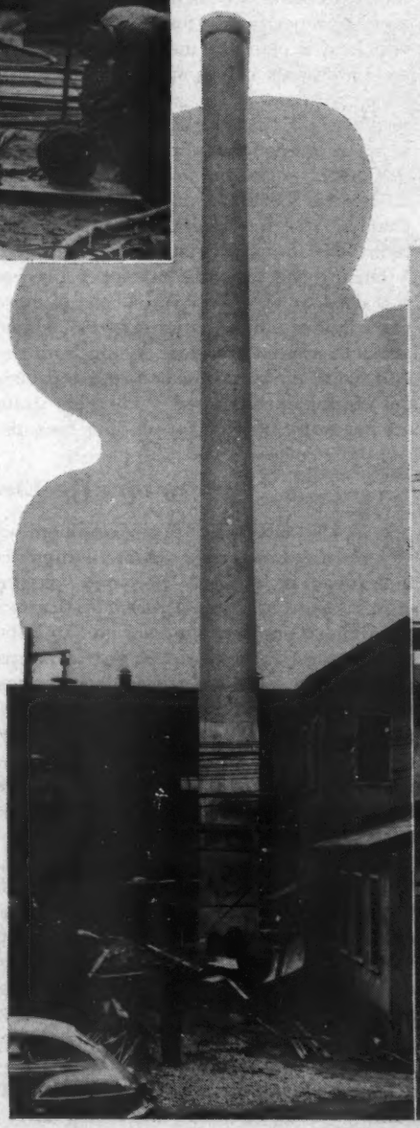
STEEL stacks that have become unsafe and are normally fit only for dismantling and scrapping are being used as forms for the building of new stacks without taking the old structures out of service during the period of erection. This is made possible by the Cement Gun Company's Gunite method of construction by which a sand-cement mixture is blown with compressed air against forms carrying suitable reinforcing mesh and rods. Several hundred stacks have been built in this way around old ones, and this experience has resulted in a method of masonry-stack construction that was tried successfully last year and that is believed to be unique.

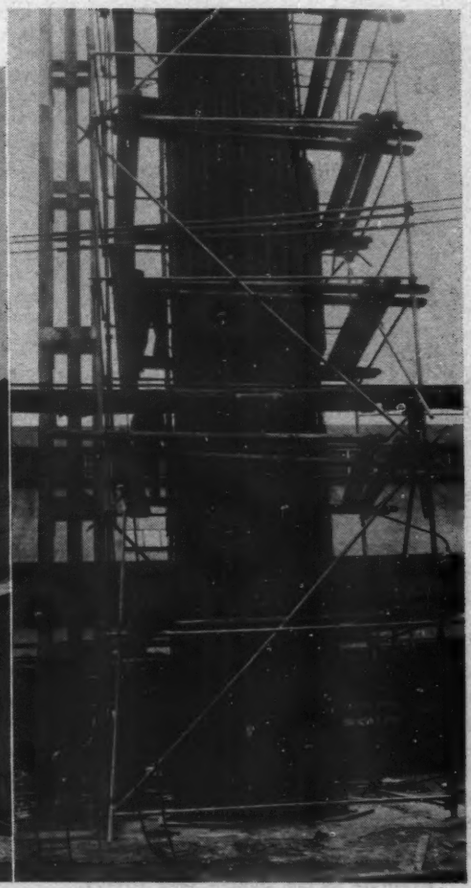
By the usual procedure, a stack is erected and then lined in accordance with requirements; but by the Cement Gun Company method lining precedes erection of the stack proper. The structure in question was built in the summer of 1945 for the Traylor Engineering & Manufacturing Company, Allentown, Pa. It is 130 feet high, has an inside diameter of 6 feet, and a thickness tapering from 12 inches at the base to 4 inches at the top, where there is a 3-inch thick collar. The foundation is of concrete in which were embedded heavy dowels to serve as anchorages for the towering chimney.

The stack itself was built in three lifts by the use of sectional forms of ¼-inch-thick plywood braced and held together by lightweight wooden ribs. Each unit was 6 feet long to permit ease of handling and hoisting into position by a single-drum Utility air hoist. Eight sections, set on top of one another, constituted the first lift, which was encircled with 2x2-inch welded wire mesh to which the lining was applied. The latter consists of a 1-inch coat of acid-resistant and refractory Gunite—a mix of silica sand and Lumnite cement in the proportion of 3½ cubic feet of sand to one bag of cement.

START AND END OF WORK

Below is the bottom section of the 48-foot lift after the 1-inch lining had been applied and with the wire mesh and the vertical and hoop reinforcing rods in place ready for guniting. The other picture shows the stack just after completion. It was built in 33 days. The stationary compressor that supplied the air to operate the cement gun is located in the building in the right foreground.





With that phase of the work completed, vertical reinforcing rods were set up with alternate rods extending a few feet above the minimum height of 48 feet, the top of the first lift. Outside of these, and spaced at regular intervals up to the 48-foot level, were fastened hoop rods and 4x4-inch wire mesh. Gunite was next directed against this framework to the specified thickness and to a height of about 44 feet. The succeeding forms were 42 and 40 feet high, respectively, and the construction procedure followed was the same as that already outlined. When the stack had attained its full height of 130 feet it was surfaced from the top down to the bottom with a flash coat of Gunite ¼ inch thick which, while still green, was brushed to give it a smooth finish and uniform color.

Guniting was done by one cement gun equipped with an I-R Size 4 drill motor that operates the mechanism which controls the speed with which the mixed sand and cement is fed into the delivery line. Compressed air for the gun was supplied by an Ingersoll-Rand Imperial Type 10 electrically driven machine in the Traylor plant and was reduced for the purpose to 70 pounds pressure per square inch. The hose through which the material was shot was 1¼ inches in diameter and reached a maximum length of 200 feet during the final stages of the job high above ground. Upon conclusion of the work the forms were dismantled by two men. Working upward, they first stripped away the ribs and then the plywood, dropping the material to the bottom of the stack for removal through a breeching opening.

The structure is a boiler stack and is therefore exposed to comparatively low temperatures. However, for higher-temperature operations it is necessary only to increase the thickness of the lining and to use an insulating, refractory aggregate such as crushed firebrick or Haydite with the Lumnite cement. The Allentown stack has now been in service for more than a year and is reported to be satisfactory in every respect. During a recent shutdown, the structure was thoroughly examined inside and outside and was found to be free from any trace of deterioration.

Sprayed Metal Used Instead of Paint

A VARIATION of the metal-spraying process that heretofore has been used chiefly for restoring worn or damaged machinery parts to original dimensions is being advanced as a means of treating metal surfaces against corrosion. The Glaspray Process Company, of San Francisco, Calif., which manufactures the equipment involved, recently demonstrated the method on the Golden Gate Bridge.

The metal is fed to the Glaspray gun in powder form instead of wire, as used by most metallizing apparatus. In the case mentioned, the powder was zinc, which was melted in the gun by a gas flame of approximately 786°F. and then blown against the steel bridge members that had previously been thoroughly cleaned of paint and rust by grit-blasting. The flame preheats the surface, and when the zinc is deposited it forms a tight bond which, it is claimed, makes it a basic, inseparable part of the structural member. The thickness of the zinc coating is approximately 1/100 of an inch and is said to maintain effective protection against salt-water corrosion for twelve years or more. Its weight is materially less than that of the five coats of lead and oil paint that have previously been applied.

During the war, the Glaspray process was used by the Navy for surfacing more than half a million square feet of ships' tanks to arrest corrosion. Aside from the gun itself, air compressors are the principal equipment required. Portable units are generally utilized for obvious reasons. For shipboard service they are stationed on the pier, alongside the vessel. The grit-blasting outfit employed with this system includes apparatus that recovers a large percentage of the abrasive by suction. It is led back through a hose to a tank container. The spraying operation concededly involves some hazard and is handled only by trained men. For protection, each wears a special face mask to which pure air for breathing is supplied through a hose connection.

Various metals such as lead, tin, aluminum, brass, bronze, copper, manganese, monel, nickel, iron, and chromium can be sprayed with the Glaspray gun. It is also designed to deposit glass or plastic coatings, and one of its promising fields is the application of plastic films on metals that are subject to acid corrosion, examples being equipment used in the chemical, petroleum-refining, and food-processing industries.

APPLICATION

A workman, wearing a protective mask to which uncontaminated breathing air is supplied, spraying molten zinc on steelwork of the Golden Gate Bridge.

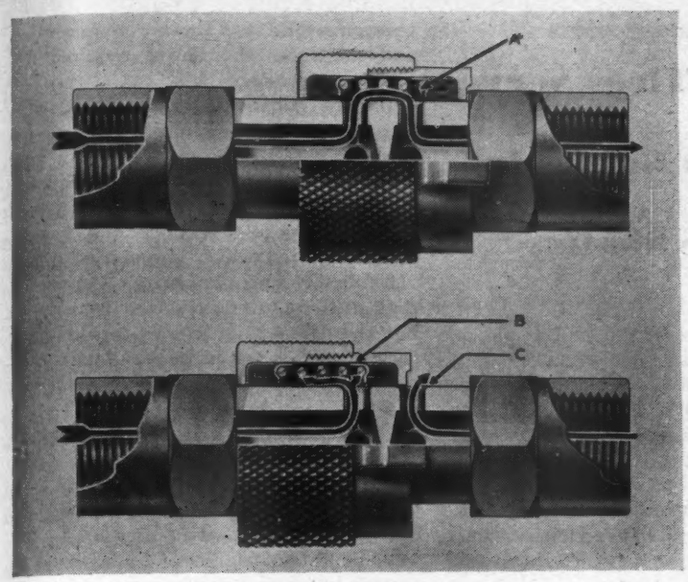
Pneumatic-Electric Mine Lamp

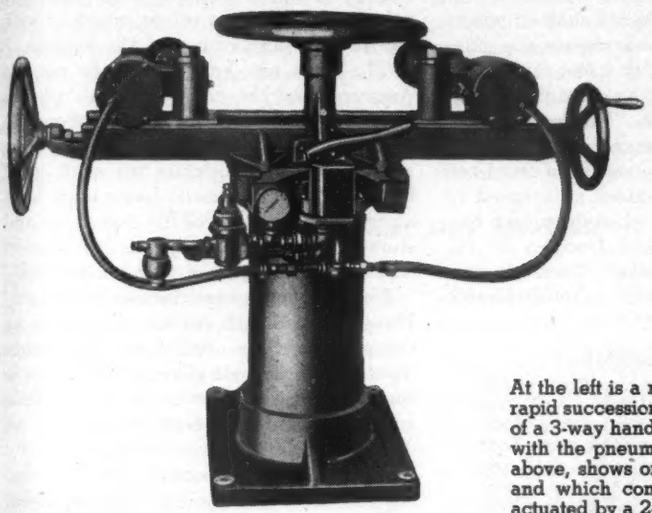
AN INTERESTING development in pneumatic-electric mine lamps is mentioned in a report prepared for the annual meeting of the British Institution of Mining Engineers that was held in London during February of this year. Lamps of this kind have been used in collieries for more than twenty years and have received the stamp of approval because they have been found to be safe under all conditions of service. They are of the air turbine-generator type, with a lighting unit consisting either of a tungsten-filament bulb or of a mercury-vapor lamp. The latter is an improvement because it gives approximately three times the number of lumens per watt (35 as against 12) with the same air consumption. In addition, it is more resistant to breakage and gives a greenish-blue light that makes it easier to distinguish foreign matter in coal. For these reasons it has been gradually displacing the earlier incandescent bulb.

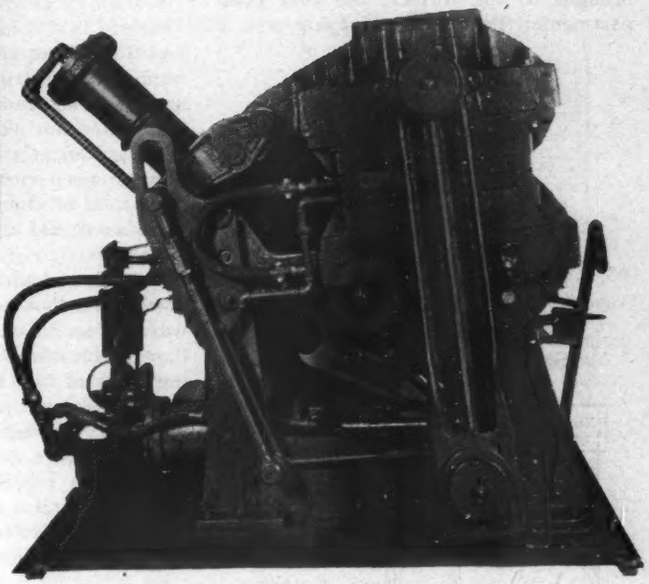
In an effort to provide still more illumination, especially at working faces, experiments are now being made with twin fluorescent tubes as the lighting unit. The over-all length of the lamp is, of course, much greater than the others, and as it can be suspended horizontally there will be better distribution of the light. Furthermore, glare is reduced to a minimum; the color—either daylight or warm white—is more pleasing; and, with an envelope of cool exhaust air around the enclosed fluorescent tubes, can probably be made just as safe. A model has been built but is still in the experimental stage.

Pneumatic-electric lamps are safe for illuminating not only coal mines but other underground areas where explosion hazards exist. As they obtain their motive air from a compressor, the same source that supplies power for rock drills, they might be used to advantage in tunneling and thus obviate the need of carrying electric cables along as footage increases.

Air Valve Designed to Meet Specific Need







STITCHER AND PRESS

At the left is a rear view of the bead and tread stitcher which calls for the use in rapid succession of first high- and then low-pressure air. This is supplied by means of a 3-way hand valve controlled by a single lever and connected by flexible lines with the pneumatic cylinders that operate the rollers. The steering-wheel press, above, shows one of the two air cylinders (bottom-left) with which it is equipped and which control the high-pressure hydraulic mechanism. Each cylinder is actuated by a 2-pressure 3-way valve and a reverse-acting diaphragm valve using low-pressure air. The latter is seen mounted on top of the cylinder. All the valves are completely enclosed to insure the application of clean air, and this permits placing them at convenient points regardless of dirt and moisture. The action of the 2-pressure, 3-way air valves by which both machines are operated is illustrated at the top-left. Slight sliding movement of the knurled sleeve turns the valve fully on or off. When at the on position *A* the air by-passes through the knurled sleeve; when at the off position *B* the air is trapped in the sleeve and the exhaust air *C* bleeds from a line or hose. Note U-shaped packing. The lips of the latter are opened by the pressure inside the valve, so that the higher the pressure the tighter the seal. The advantage of this type of packing is that it safeguards against leakage by taking up any minute wear of the stainless-steel valve body.

WHEN designing and manufacturing engineers put their heads together, something usually develops that simplifies operations and improves the quality of the product. We have in mind a special air valve that is the result of such cooperation and that was developed primarily for a bead and tread stitcher used in making tires. However, that is only one of its many applications. The valve is of the 2-pressure, 3-way type and was designed for the Akron Standard Mold Company by C. B. Hunt & Son, Inc.

A stitcher or stitching, as applied to tire manufacture, has nothing to do with sewing. It is the machine or process by which treads are rolled on passenger-car and truck tires. This was formerly done manually with rollers similar to those used by paper hangers to smooth down the joints. Now the work is done mechanically from start to finish by exerting first high and then low pressure in quick succession against the rollers. High pressure is applied to the heavy or actual tread area of the tire, but when the rollers run over the sidewalls, where the rubber is thinner, the pressure is reduced to avoid marking them.

Initially, two separate air valves were required to control the stitching operation. Now the pneumatic cylinders that operate the rollers are actuated by one Quick-As-Wink valve which, with but one lever, not only supplies the air to induce the desired pressures but also exhausts it to atmosphere, thus reversing the cylinder pistons and placing them in position to repeat the cycle.

Another machine in the same plant has been made more positive in its action by pneumatic control. It is a steering-wheel press which has been equipped with four totally enclosed Hunt valves using low-pressure air. Two of them are of the type already mentioned and receive air from pilot lines, in the form of small copper tubing, controlled by "timers." These valves operate two diaphragm valves each of which actuates a pneumatic cylinder which, in turn, serves as the prime mover for a large hydraulic valve through which the press is made to function. The action of the diaphragm valves is so controlled that the main hydraulic valves are automatically reversed within a prescribed period, depending upon the length of time that is required to cure the raw material and to mold it into a finished steering wheel.

Rubber Tires Serve as Skip Guides in Mine Shafts

SMOOTHER travel and an appreciable reduction in maintenance costs are some of the results obtained through a change from steel shoes to pneumatic skip guides in the case of the ore-hoisting shafts of the Wright-Hargreaves gold mine at Kirkland Lake, Ont., Canada. The system was developed and installed by the company on Shafts 3 and 5, and its use over a period of years has proved its practicability.

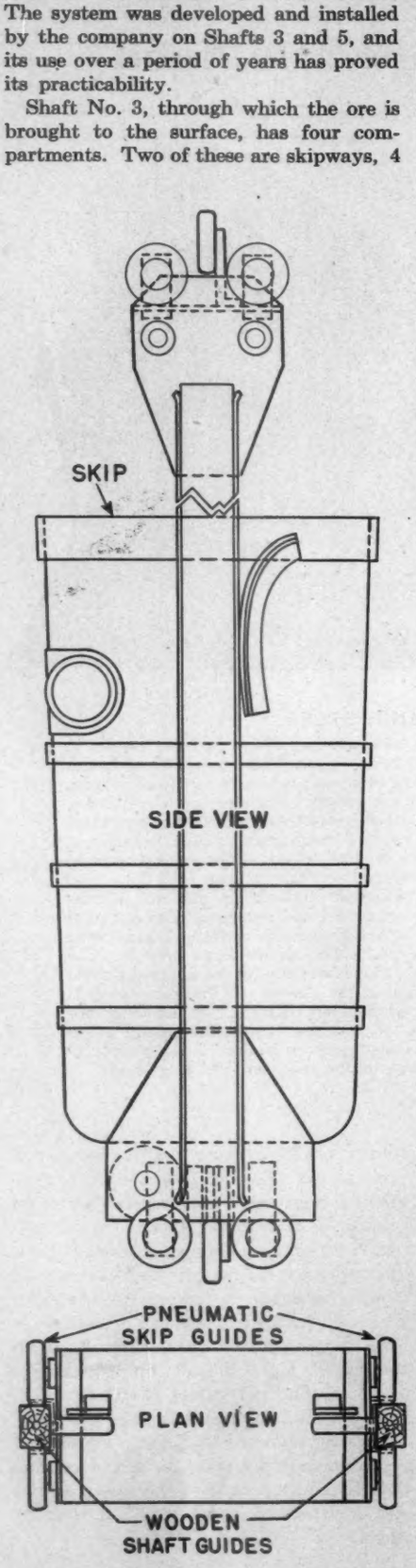
Shaft No. 3, through which the ore is brought to the surface, has four compartments. Two of these are skipways, 4 feet 6 inches square, which have a maximum hoisting depth of 4000 feet. There are 30 levels and nine loading pockets, and the 4-ton skip assemblies installed are elevated at a speed of 1450 feet per minute when carrying ore. The shaft guides are of Douglas fir and Australian kaari wood and are 3¾ by 5¾ inches in section.

No. 5 is an underground shaft or winze. Two of its four compartments are skipways, 4 feet 8 inches by 4 feet 6 inches in dimensions, which have a maximum hoisting depth of 2500 feet. There are sixteen levels with one permanent and several temporary loading pockets, and the 4-ton skip assemblies are raised at a speed of 1200 feet a minute when handling ore. The shaft guides are of Douglas fir 4¾ by 5¾ inches in section. These wooden guides were subjected to considerable wear when the steel shoes were in service, and the shoes themselves required frequent replacement.

By the substitute arrangement, each skip assembly is equipped with twelve rubber-tired wheels, six at the top and six at the bottom, as the accompanying drawings show. Each of these consists of a chrome nickel-steel axle and a ball-bearing rim on which is mounted a Size 250 four-ply pneumatic tire. Originally, tires of two-ply construction were used, but they were found to be too light for the work. Each axle has a ⅞x2-inch thread extension that is machined eccentrically and provides a means of attaching the wheel to the skip and of adjusting the pressure exerted by it on the shaft guide. By turning the axle with a wrench, it is possible for the operator to change the position of the wheel in relation to the wooden guide, to move it 5/16 inch, or enough to compensate for wear or for any other condition that might interfere with the proper functioning of the system.

The tires are kept under 40 pounds pressure, and the compressed air that is needed to inflate them is taken from the regular mine supply and is reduced by a valve at the air outlet in the shaft head house. Careful records have been kept since the installation of the 4-ply tires and show that a set on a skip was still in good service condition after 3248 hours of use.

Five advantages are claimed by Wright-Hargreaves for the pneumatic guides, as compared with the steel shoes. As already mentioned, the operation of the skips is smooth; time required for shaft-guide and skip repairs has been measurably reduced; and the tires can be adjusted easily and quickly to compensate for wear and thus increase service life. In addition, skip travel is well-nigh noiseless, and the wooden guides remain clean.



WHEEL ASSEMBLY

One of the twelve rubber-tired wheels that serve in place of steel guide shoes on the skips in the ore-hoisting shafts of the Wright-Hargreaves mine. Each consists of a chrome nickel-steel axle with an eccentrically machined threaded extension, of a ball-bearing rim, and of a 4-ply pneumatic tire. Construction permits adjusting pressure of wheels on the wooden guide shafts and change in position to compensate for wear on tires.

Research in Coal Processing

THE importance of coal preparation, as distinct from mining and utilization, is being recognized more and more, especially in the United States where universities are now said to be offering courses on the subject with a view to converting the raw material into products suitable for specific purposes. A trend in this direction is evidenced by the pilot plant built by the United States Steel Corporation for processing and washing coal. It has a capacity of 600 to 700 tons an hour and cost about $4,000,000.

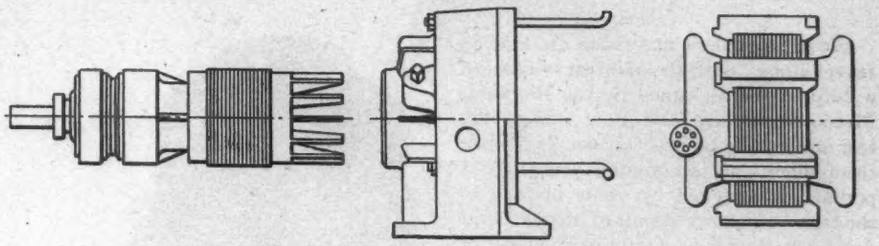
On the face of it, the outlay is a heavy one, but is warranted in view of the potentialities. There is a vast reserve of coal in the State of Pennsylvania that is of a grade good only for use as an industrial fuel. The aim of the researchers is to convert it into a product suitable for metallurgical use. If they succeed in their efforts, the plan is to erect a commercial-size plant capable of handling 2800 tons an hour.

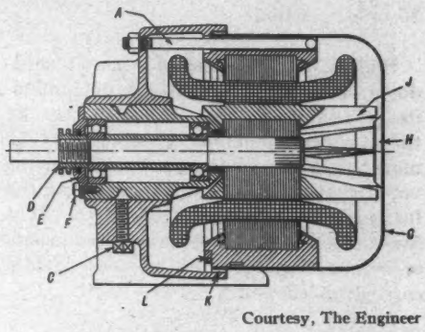
Demountable Electric Motor Facilitates Repair

QUICK repair or replacement of parts in case of breakdown is practicable, it is claimed, with a new demountable electric motor designed and put in production by a Spanish manufacturer, Bomba Prat, S.A. The unit is of the squirrel-cage induction type and so far is being made in sizes up to 3½ hp. at 3000 rpm. It consists of three main assemblies —the frame, stator, and rotor, which includes the bearings with housing, shaft, and driving pulley. The frame is the supporting member and holds the others so that either can be withdrawn without affecting the other or the casing.

Removal of the stator is effected by loosening the nuts on three hook bolts, turning the hook ends, and pushing the electrical connections back through a gland in the side of the frame. The opposite end of the frame forms a collar which carries the ball-bearing housing. This is secured by three studs which, when loosened, permit its withdrawal, together with the shaft and rotor. The latter assembly can then be dismantled by removing a gland nut and three bolts so as to withdraw the rotor and shaft from the housing and thus give access to the ball bearings. The casing, which is of pressed steel, serves merely as an enclosure and conduit for the cooling air, while fan blades on the nondriving end of the rotor circulate the air around the stator and expel it either through openings or louvres.

As compared with the company's standard motor of like capacity, the new unit differs little in weight. With a single shaft extension it is approximately 17 percent longer over-all but about 8 percent less in height as well as in diameter. In case of motor trouble, units of this type do not have to be disassembled entirely to find the cause and can be repaired without dismounting them from the machines they operate.





Courtesy, The Engineer

SECTION THROUGH MOTOR

A, one of the hook bolts by which the stator is held in place; *C*, stud that helps to hold the rotor assembly in the frame; *D*, *E*, and *F*—gland nut, cover, and bolt—that permit withdrawal of rotor and shaft from bearing housing; *G*, casing; *H*, cooling-air inlet; *J*, fan blades; *K*, air outlet; *L*, stator seating. From left to right, top, rotor, frame, and stator. After the latter is removed, the rotor assembly can be withdrawn from either end.

More About the Air-Pak

FURTHER details are now available concerning the Scott Air-Pak breathing apparatus for fire fighters that was mentioned in our February issue in connection with a fire in the Sunshine Mine at Kellogg, Idaho. Known popularly as the "walk-around bottle," it was developed during the war as an aid to high-altitude flying. With it, members of a plane's personnel could leave their stations and perform other duties, whereas previously they had had to remain stationary to utilize the permanent oxygen installations.

IN SERVICE

Front and rear views of the Air-Pak, a safe breathing apparatus that had its inception in the skies.

The first Air-Paks carried oxygen, but it was recognized that normal breathing air could be used in them, and they have been converted accordingly. The effect is that of taking pure air to the hazard instead of refining bad air before breathing it. The apparatus is available for immediate application and requires no chemicals. The face mask used with it is of the Willson type, and the wearer, before entering a danger zone, can breathe through the open end of the mask hose. Upon reaching a location where there is bad air he connects the hose with his compressed-air supply and opens a valve.

The accompanying picture illustrates the harness and the manner of wearing it. Two types of air cylinders are available. The back-pack model is mounted on a contoured aluminum plate, and cylinders can be interchanged in three minutes. A pressure valve indicates when the supply of air is getting low. A sling-type model is designed for chemical laboratory work and for instant application in all areas where breathing hazards exist.

In addition to fire-fighting service, the units are suitable for use by workmen cleaning fuel tanks, ships' holds, etc., and in granaries and gaseous mines. The Air-Pak is manufactured by the Scott Aviation Corporation of Lancaster, N. Y.

White or Colored Tires

OF CONSIDERABLE interest, particularly to motorists, is the recent announcement that the B. F. Goodrich Company has found a substitute for carbon black, a material used by it to give rubber strength and resistance to heat and abrasion. Carbon black, actually soot, is the product of imperfect combustion of natural gas and, obviously, smudges or discolors everything with which it comes in contact or of which it constitutes an ingredient. Even a small percentage of it in rubber makes it impossible to achieve anything but a dark end product. Car owners are partial to tires with white sidewalls; but now we are informed that treads as well as sidewalls in white or any desired color are a possibility. Other rubber goods that necessitate the use of carbon black will be similarly affected.

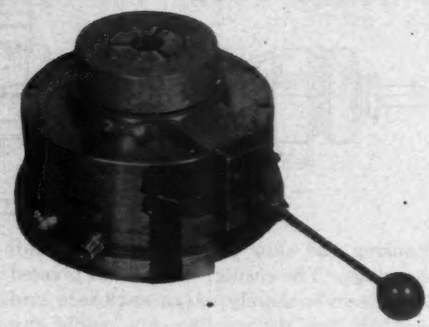
The new material is paradoxically referred to as "white soot" and has been the object of laboratory research by Goodrich for more than a decade. It is manufactured of sand and alcohol which, through a series of chemical reactions, are converted into ethyl silicate, a volatile liquid. This is subjected to a process of combustion, yielding a superfine translucent powder made up of particles which, under the electron microscope, are found to be of the same size and shape as those of carbon black.

Industrial Notes

Bicycle pedalers may soon be able to travel along "with the greatest of ease" if a 2-hp. engine designed by the Reynolds Metals Company and now undergoing test is found to be practicable. It is built throughout of aluminum, weighs 32 pounds, is fastened by three clamps to the rear fork of any standard bicycle, and drives the latter at a maximum speed of 35 miles per hour.

Boilers may be cleaned without shutdown, it is claimed, by the use of Gamlenite, a compound put on the market by the Gamlen Chemical Company. The material forms a dense, nonpoisonous vapor that penetrates to every part of the furnace and firesides of boiler metal. It is said to reduce hard slag and other deposits of combustion to a fine powder that is carried up the stack by the draft.

Redmer Air Devices Corporation has announced an addition to its line of collet air chucks—an indexing fixture that is the result of nearly two years of study among manufacturers as to the type most needed by them. The chuck is designed for ease of operation and to eliminate errors in



indexing as much as possible. Indexing posts and numbers are on the outside, thus making it unnecessary to remove the fixture from the bed of the machine in changing over to another position. Indexing is performed manually, but the collet is air-operated and has a capacity up to and including 2 inches. The chuck is said to be suitable for toolroom use as well as for production runs and can be utilized as a regular holding fixture without indexing for operations such as drilling, milling, tapping, etc. Standard equipment has 2-3-4-5-6-8-9-12 positioning indexes; special units are available.

Smokers have been known to cause fires by throwing matches, ashes, or butts into wastepaper baskets. To guard against such carelessness, the Stratosol Corporation has designed a metal container that also serves, it is claimed, as an extinguisher. The Firewarden, as it is named, has a double top with a large opening to receive scrap. This partial cover is shaped so that carbon dioxide, given off by flames, accumulates inside the basket, thus preventing the entrance of fresh air and smothering the fire.

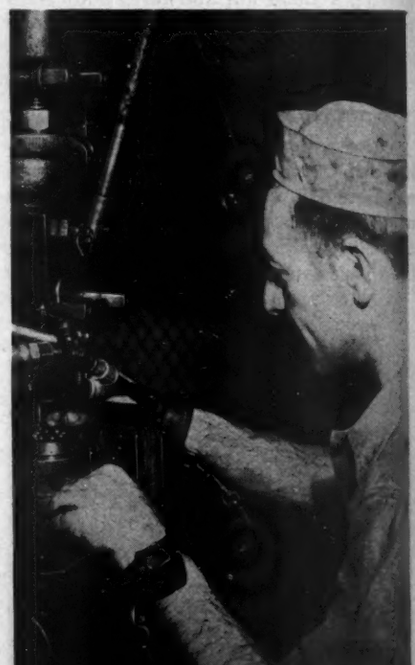
Greyhound buses, 4500 of them, are being made safer for night-driving. They are being outlined with Scotchlite, a plastic-film trim in every square inch of which are embedded thousands of microscopic lenses that reflect light in the headlight glare of an approaching car. It is advocated that this method of protection be generally adopted, especially for heavy motor vehicles, to lessen the hazard of stalled or parked cars during the hours of darkness.

Designed for the continuous and fine filtration of plating solutions, the Fulflo separator of the Commercial Filters Corporation is said to insure work of higher quality with fewer rejects and to lengthen the period of the bath's usefulness. Units are provided with Honeycomb filters and are available in a wide range of capacities to meet the needs of well-nigh any shop. One model, about the size of an umbrella stand, is equipped with twelve filter tubes and handles 1000 gallons an hour. Tubes can be replaced while operations are in progress and have a service life of from six to eight weeks.

Production of a newly designed constant-ratio mixer for low-pressure air and combustible gas for industrial process equipment has been announced by the Bryant Heater Company. Named Flomixer, the unit makes use of the energy of a stream of air at any pressure up to 3 pounds to entrain a gas and to deliver the mixture at unusually high pressure to the burners. Its efficiency is said to be 50 percent greater than that of available types and is attributed to internal changes that reduce air requirements. According to the manufacturer, air at 1 pound pressure will produce a mixture pressure equivalent to a 13-inch water column when using natural gas and a 11½-inch column with manufactured gas. The gas-ratio adjuster is suitable for any kind of gas, and changeover in fuel within a

BREAKS BUBBLES

This picture plainly shows how lubricating oil for high-speed engines reacts under the influence of a new antifoam agent recently produced by Gulf Oil Corporation. The girl is forcing air simultaneously into a couple of sealed beakers with a hand pump. In the one at the left the lubricant is untreated and is being whipped into foam just as it is normally under the churning action of the crankshaft and other working parts. The oil in the other beaker is treated and remains in a fluid state because the additive reduces surface tension and causes the bubbles to break upon reaching the surface, thus preventing foaming and possible faulty engine functioning, if not shutdown.

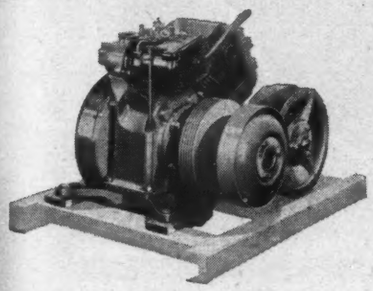


MANACLED TO MACHINE

For his own safety, Peter Baker is chained to the punch press that he operates to stamp rivet holes in hardsteel ball- and roller-bearing cages at SKF Industries, Inc., in Philadelphia, Pa. The shackling device synchronizes the movement of the hands with the motion of the machine. When the press descends, cords attached to leather wristbands pull the hands out of harm's way. The manacles have helped to reduce plant accidents by 22 percent.

range of 550-3200 Btu., is possible without a change in equipment. Other advantages claimed for the Flomixer are accessibility and ease of breakdown, while interchangeable parts permit right or left or up and down installation. It is made in pipe sizes from ¾ inch to 4 inches.

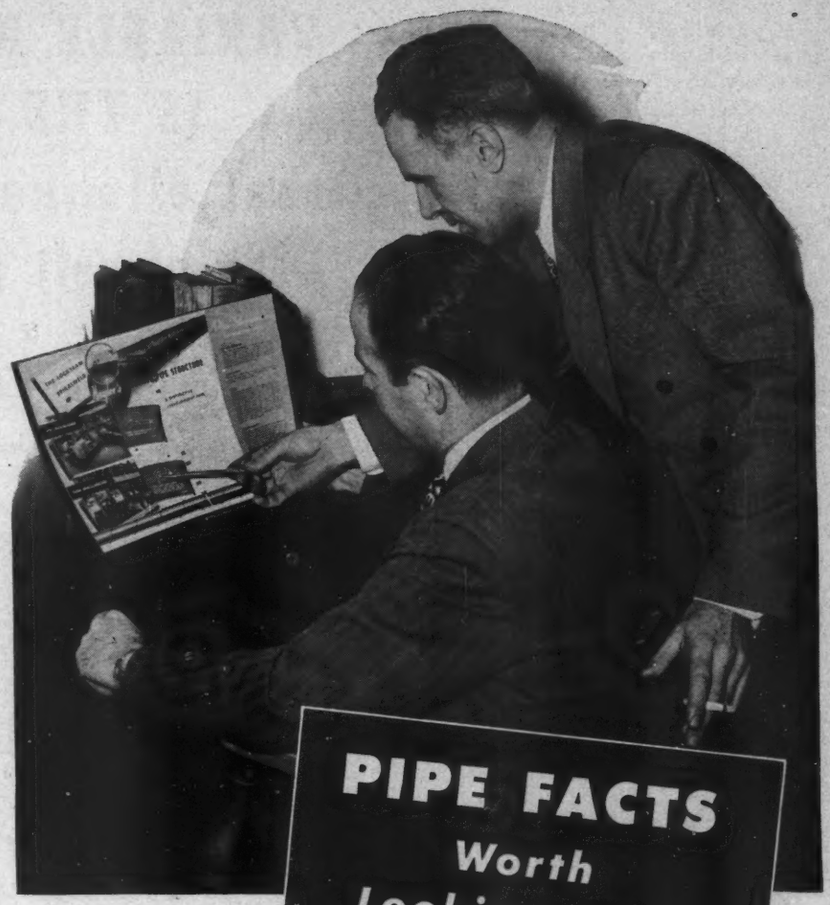
In its Power Package, Salsbury Motors, Inc., is said to have made available for the first time in the low-horsepower field a completely automatic unit in which drive ratios are controlled by the driven unit and clutch engagement is controlled by engine speed. The heart of the "package" is the patented Salsbury Transmission which consists of a variable-diameter drive pulley, a variable-diameter driven pulley, and a V-belt. This assembly gives automatic variable ratios over a 4 to 1 range. It is claimed that normal over-all reductions may vary from 4 to 1 to 1 to 1



for light-duty, high-speed service and from 200 to 1 to 50 to 1 for heavy-duty, low-speed requirements. The clutch is built into the drive pulley. It is an automatic, centrifugally operated, opposed-shoe type that provides smooth engagement and disengagement with acceleration or deceleration of the engine. The latter is a single-cylinder, 4-cycle, air-cooled unit and develops 6.5 hp. at 3200 rpm. Added features are a horizontal carburetor with a short, straight intake manifold mounted on an inclined cylinder and pressure lubrication. According to the manufacturer, the Power Package is suitable for stationary, portable, and vehicular use and especially where the service involves high starting torques or momentary unloading or overloading.

Reynalite is the trade name of a new material suitable for house building and furniture manufacture. It is of the sandwich type with outer sheets of aluminum between which is bonded a panel of plywood, of wood-fiber composition, or of an inorganic substance. The material is said to be of high strength and light weight. It is produced by Reynolds Metals Company.

Keeping tracks in mine haulageways clean is said to be an easy matter with the new machine developed for the purpose by the American Mine Door Company. Together with a conveyor, it is 20½ feet long and is moved by a locomotive. Irrespective of the hardness of the dirt, it



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is said to remove it readily from between the rails and, under proper conditions, to load it into a car at the rear at the rate of a ton a minute.

Painting the San Francisco-Oakland Bay Bridge is a continuous job, and to save the time and expense of rigging scaffolding to reach the underside, the structure has been equipped with permanent, transverse platforms. Each of these is more than 60 feet long, is suspended from rollers that ride on the lower chord of the bridge, and is moved along by two opposing hand cranks which must be operated simultaneously to keep the scaffold in line.

Microtex is a new air-dry rack coating that is unaffected, it is claimed, by ordinary plating and anodizing solutions, not excepting alkaline cleaners at boiling temperatures and the electrolytic sulphuric-acid strip that is used to dissolve bright nickel. The material is a thermoplastic insulator that does not depend upon shrinkage to attain maximum adhesion. It is produced by the Michigan Chrome & Chemical Company and is applied by dipping, brushing, or spraying.

Feature of a tractor shovel recently announced by Trackson Company is a bucket that is wider than the tractor tracks and that can be dumped from any point of its lift. It has an excavating range of 14 inches below the track line to 56 inches above it and can be used to dig, stockpile, dump loads into trucks, ditch, spread, or, by substituting a blade for the bucket, as a bulldozer. The IT4 is Caterpillar mounted.

Thick, transparent sheets of plastic anchored in a horseshoe permanent magnet are made by the Dilley Manufacturing Company to protect machine-tool operators from flying chips, metal dust, sparks, oil, etc. Known as the Magnetic Grip-Shield, it is held in place by the magnet, and a slight twist breaks the grip of the safety device for removal or change of position. It does not obstruct vision, it is claimed, and comes in varying sizes from 3x4 to 8x10 inches.

Bead-dispensing equipment used by the California Highway Division for dashed traffic striping has been improved upon in its Headquarters Shop, according to a recent report made by that department. The units are mechanically controlled and have been provided with a number of devices that considerably facilitate operations. By means of an air-lift arrangement a machine can be raised clear of the pavement to stop the flow of beads, and an air-actuated clutch serves to synchronize the actions of the bead dispenser and the lacquer spray. Lastly, gates were installed making it possible to apply beads to one or more stripes.

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